Drug resistance interpretation: PR

HIVDB 9.5.1 (2023-11-05)

PI Major Mutations: None
PI Accessory Mutations: None
PR Other Mutations: L10I 100% (conv=2,069) • T12V 100% (conv=2,069) • I13V 100% (conv=2,069) • E35D 100% (conv=3,041) • M36I 100% (conv=3,041) • R41K 99% (conv=3,041) • K45R 100% (conv=2,943) • R57K 99% (conv=2,717) • L63V 100% (conv=2,918) • H69K 99% (conv=2,687) • V77I 100% (conv=2,952) • L89I 100% (conv=2,296)

Protease Inhibitors	
atazanavir/r (ATV/r)	Susceptible
darunavir/r (DRV/r)	Susceptible
fosamprenavir/r (FPV/r)	Susceptible
indinavir/r (IDV/r)	Susceptible
lopinavir/r (LPV/r)	Susceptible
nelfinavir (NFV)	Susceptible
saquinavir/r (SQV/r)	Susceptible
tipranavir/r (TPV/r)	Susceptible

PR comments

Other

- **L10I/V** are polymorphic, PI-selected accessory mutations that increase the replication of viruses with other PI-resistance mutations.

Mutation scoring: PR

HIVDB 9.5.1 (2023-11-05)

No drug resistance mutations were found for PI.

Drug resistance interpretation: RT

HIVDB 9.5.1 (2023-11-05)

NRTI Mutations: M41L 100% (conv=2,096) • S68G 99% (conv=1,527) • M184V 99% (conv=2,182) • T215F 99% (conv=1,835)
NNRTI Mutations: A98G 99% (conv=2,162) • K103N 97% (conv=1,176) • V108I 99% (conv=1,132)
RT Other Mutations: E6A 100% (conv=2,567) • E28A 100% (conv=2,290) • V35T 100% (conv=2,131) • V60I 100% (conv=1,873) • K122E 100% (conv=2,094) • D123S 99% (conv=947) • R125RG R:43%, G:57% (conv=1,270) • I135T 100% (conv=2,018) • K173M 100% (conv=1,532) • Q174K 100% (conv=1,532) • D177E 100% (conv=1,549) • I202V 100% (conv=2,454) • Q207D 99% (conv=1,572) • R211S 100% (conv=1,571) • L228H 100% (conv=1,854) • V245E 99% (conv=320) • D250E 98% (conv=293)

Nucleoside Reverse Transcriptase Inhibitors	
abacavir (ABC)	Intermediate Resistance
zidovudine (AZT)	High-Level Resistance
stavudine (D4T)	Intermediate Resistance
didanosine (DDI)	Intermediate Resistance
emtricitabine (FTC)	High-Level Resistance
lamivudine (3TC)	High-Level Resistance
tenofovir (TDF)	Low-Level Resistance

Non-nucleoside Reverse Transcriptase Inhibitors	
doravirine (DOR)	Low-Level Resistance
efavirenz (EFV)	High-Level Resistance
etravirine (ETR)	Potential Low-Level Resistance
nevirapine (NVP)	High-Level Resistance
rilpivirine (RPV)	Low-Level Resistance

RT comments

NRTI

- **M41L** is a TAM that usually occurs with T215Y. In combination, **M41L** plus T215Y confer intermediate / high-level resistance to AZT and d4T and contribute to reduced ddI, ABC and TDF susceptibility.
- **S68G** is a polymorphic mutation that is often selected in combination with K65R. It partially restores the replication defect associated with K65R.
- **M184V/I** cause high-level in vitro resistance to 3TC and FTC and low/intermediate resistance to ABC (3-fold reduced susceptibility). **M184V/I** are not contraindications to continued treatment with 3TC or FTC because they increase susceptibility to AZT and TDF and are associated with clinically significant reductions in HIV-1 replication.
- **T215Y/F** are TAMs that causes intermediate/high-level resistance to AZT and potentially low-level resistance to ABC and TDF.

NNRTI

- **A98G** is a non-polymorphic accessory mutation associated with low-level reduced susceptibility to each of the NNRTIs.
- **K103N** is a non-polymorphic mutation that confers high-level reductions in NVP and EFV susceptibility. It is the most commonly transmitted DRM.
- **V108I** is a relatively non-polymorphic accessory mutation selected in vitro and/or in vivo with each of the NNRTIs. It appears to contribute to reduced susceptibility to most NNRTIs only in combination with other NNRTI-resistance mutations.

- This virus is predicted to have low-level reduced susceptibility to **RPV**. The use of the combination of CAB/**RPV** should be considered to be relatively contraindicated.

Mutation scoring: RT

HIVDB 9.5.1 (2023-11-05)

Drug resistance mutation scores of NRTI: Download CSV

Rule	ABC	AZT	D4T	DDI	FTC	3TC	TDF
M41L	5	15	15	10	0	0	5
M41L + M184V + T215F	10	0	0	0	0	0	0
M41L + T215F	10	10	10	10	5	5	10
M184V	15	-10	-10	10	60	60	-10
T215F	10	60	40	15	0	0	10
Total	50	75	55	45	65	65	15

Drug resistance mutation scores of NNRTI: Download CSV

Rule	DOR	EFV	ETR	NVP	RPV
A98G	15	15	10	30	15
V108I	10	10	0	15	0
K103N	0	60	0	60	0
Total	25	85	10	105	15

Drug resistance interpretation: IN — HIVDB 9.5.1 (2023-11-05)

INSTI Major Mutations: N155H

INSTI Accessory Mutations: None

IN Other Mutations: K14R • A21T • L28I • V31I • I60M • I72IV • K156N • D167E • V201I • K211R • L234I • I268L • S283G

Integrase Strand Transfer Inhibitors	
bictegravir (BIC)	Potential Low-Level Resistance
cabotegravir (CAB)	Low-Level Resistance
dolutegravir (DTG)	Potential Low-Level Resistance
elvitegravir (EVG)	High-Level Resistance
raltegravir (RAL)	High-Level Resistance

IN comments

Major

- **N155H** is a common nonpolymorphic INSTI-resistance mutations. It has been reported in a high proportion of persons developing VF and HIVDR while receiving RAL, EVG, DTG, and CAB. Alone, it reduces RAL and EVG susceptibility about 10 and 30-fold, respectively. It has minimal effect on susceptibility to DTG, BIC, and CAB.
- This virus is predicted to have low-level reduced susceptibility to **CAB**. The use of the combination of **CAB**/RPV should be considered to be relatively contraindicated.

Mutation scoring: IN — HIVDB 9.5.1 (2023-11-05)

Drug resistance mutation scores of INSTI: Download CSV

Rule	BIC	CAB	DTG	EVG	RAL
N155H	10	25	10	60	60

Drug resistance interpretation: PR

HIVDB 9.5.1 (2023-11-05)

PI Major Mutations: M46I • I54L • N88S

PI Accessory Mutations: F53L

PR Other Mutations: L10V • G16E • K20R • E35D • M36V • N37T • P39S • R41K • K55KR • R57RK • I62V • L63T • H69K • A71DV • I72IT • T74S • L89M • I93LM

Protease Inhibitors	
atazanavir/r (ATV/r)	High-Level Resistance
darunavir/r (DRV/r)	Low-Level Resistance
fosamprenavir/r (FPV/r)	High-Level Resistance
indinavir/r (IDV/r)	Intermediate Resistance
lopinavir/r (LPV/r)	Intermediate Resistance
nelfinavir (NFV)	High-Level Resistance
saquinavir/r (SQV/r)	Intermediate Resistance
tipranavir/r (TPV/r)	Susceptible

PR comments

Major

- **M46I/L** are relatively non-polymorphic PI-selected mutations. In combination with other PI-resistance mutations, they are associated with reduced susceptibility to each of the PIs except DRV.
- **I54M/L** are non-polymorphic mutations selected primarily by FPV and DRV. **I54M/L** reduce susceptibility to LPV, ATV, and DRV.
- **N88S** is a non-polymorphic mutation usually selected by NFV, ATV, and IDV. It confers high-level resistance to ATV and increases susceptibility to DRV.

Accessory

- **F53L** is a nonpolymorphic accessory mutation selected primarily by SQV, IDV, ATV and LPV. In combination with other mutations, it is associated with reduced susceptibility to ATV and possibly LPV. F53Y is an uncommon nonpolymorphic accessory PI-selected mutation that has not been well studied.

Other

- **L10I/V** are polymorphic, PI-selected accessory mutations that increase the replication of viruses with other PI-resistance mutations.
- **K20R** is a highly polymorphic PI-selected accessory mutation that increases replication fitness in viruses with PI-resistance mutations.
- **A71V/T** are polymorphic, PI-selected accessory mutations that increase the replication of viruses with other PI-resistance mutations.
- **T74S** is a PI-selected accessory mutation that is polymorphic in most non-B subtypes.

- There is evidence for low-level **DRV** resistance. If **DRV** is administered it should be used twice daily.

Mutation scoring: PR

HIVDB 9.5.1 (2023-11-05)

Drug resistance mutation scores of PI:

Download CSV

Rule	ATV/r	DRV/r	FPV/r	IDV/r	LPV/r	NFV	SQV/r	TPV/r
M46I	10	0	10	10	10	30	10	5
F53L	10	0	0	0	0	10	15	0
I54L	15	20	60	10	20	20	15	-10
N88S	60	-5	-10	15	0	60	15	0
Total	95	15	60	35	30	120	55	-5

Drug resistance interpretation: RT

HIVDB 9.5.1 (2023-11-05)

NRTI Mutations: M41L • S68G • V75VM • M184V • T215F

NNRTI Mutations: A98G

RT Other Mutations: E6D • V35T • K49KR • V60I • K122E • D123S • K173A • Q174K • D177E • I178L • T200A • Q207K • R211S • F214L • V245E • D250E • A272P • R284K • T286A • V292I • I293V • E312N • K512R • E514D • E516EV • S519N • Q524K • K527E • E529D • A534S • A554S • V559I

Nucleoside Reverse Transcriptase Inhibitors	
abacavir (ABC)	Intermediate Resistance
zidovudine (AZT)	High-Level Resistance
stavudine (D4T)	High-Level Resistance
didanosine (DDI)	High-Level Resistance
emtricitabine (FTC)	High-Level Resistance
lamivudine (3TC)	High-Level Resistance
tenofovir (TDF)	Low-Level Resistance

Non-nucleoside Reverse Transcriptase Inhibitors	
doravirine (DOR)	Low-Level Resistance
efavirenz (EFV)	Low-Level Resistance
etravirine (ETR)	Potential Low-Level Resistance
nevirapine (NVP)	Intermediate Resistance
rilpivirine (RPV)	Low-Level Resistance

RT comments

NRTI

- **M41L** is a TAM that usually occurs with T215Y. In combination, **M41L** plus T215Y confer intermediate / high-level resistance to AZT and d4T and contribute to reduced ddI, ABC and TDF susceptibility.
- **S68G** is a polymorphic mutation that is often selected in combination with K65R. It partially restores the replication defect associated with K65R.
- **V75T|M|A|S** are nonpolymorphic accessory NRTI-selected mutations. They appear to have minimal phenotypic effects on AZT, ABC, and TDF.
- **M184V|I** cause high-level in vitro resistance to 3TC and FTC and low/intermediate resistance to ABC (3-fold reduced susceptibility). **M184V|I** are not contraindications to continued treatment with 3TC or FTC because they increase susceptibility to AZT and TDF and are associated with clinically significant reductions in HIV-1 replication.
- **T215Y|F** are TAMs that causes intermediate/high-level resistance to AZT and potentially low-level resistance to ABC and TDF.

NNRTI

- **A98G** is a non-polymorphic accessory mutation associated with low-level reduced susceptibility to each of the NNRTIs.
- This virus is predicted to have low-level reduced susceptibility to **RPV**. The use of the combination of CAB/**RPV** should be considered to be relatively contraindicated.

Mutation scoring: RT

HIVDB 9.5.1 (2023-11-05)

Drug resistance mutation scores of NRTI: Download CSV

Rule	ABC	AZT	D4T	DDI	FTC	3TC	TDF
M41L	5	15	15	10	0	0	5
M41L + M184V + T215F	10	0	0	0	0	0	0
M41L + T215F	10	10	10	10	5	5	10
M184V	15	-10	-10	10	60	60	-10
T215F	10	60	40	15	0	0	10
V75VM	0	10	30	15	0	0	0
Total	50	85	85	60	65	65	15

Drug resistance mutation scores of NNRTI: Download CSV

Rule	DOR	EFV	ETR	NVP	RPV
A98G	15	15	10	30	15

Drug resistance interpretation: IN

HIVDB 9.5.1 (2023-11-05)

INSTI Major Mutations: None
INSTI Accessory Mutations: None
IN Other Mutations: E13D 100% (n=1,260) • K14R 99% (n=1,250) • V31I 100% (n=1,261) • I60M 100% (n=855) • I72V 100% (n=625) • G106A 99% (n=75) • T112V 97% (n=83) • I113V 98% (n=83) • T124A 99% (n=125) • T125A 100% (n=123) • V126F 100% (n=123) • G134S 98% (n=217) • I135V 97% (n=217) • K136Q 97% (n=217) • F139Y 99% (n=280) • D167E 99% (n=454) • V201I 99% (n=380) • T206S 99% (n=335) • Q221E 99% (n=561) • N222K 99% (n=561) • L234I 99% (n=458) • D256E 99% (n=492) • S283G 100% (n=414)

Integrase Strand Transfer Inhibitors	
bictegravir (BIC)	Susceptible
cabotegravir (CAB)	Susceptible
dolutegravir (DTG)	Susceptible
elvitegravir (EVG)	Susceptible
raltegravir (RAL)	Susceptible

Mutation scoring: IN

HIVDB 9.5.1 (2023-11-05)

No drug resistance mutations were found for INSTI.