Drug resistance interpretation: PR

HIVDB 9.5.1 (2023-11-05)

PI Major Mutations: None
PI Accessory Mutations: None
PR Other Mutations: V11K • T12W • I13Q • K14L • I15K • G16R • G17R • Q18K • K20R • T31P • V32A • E35D • M36I • R41K • H69K • L89M

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

- **K20R** is a highly polymorphic PI-selected accessory mutation that increases replication fitness in viruses with PI-resistance mutations.
- V32I is a non-polymorphic mutation selected by LPV, ATV, and DRV which is associated with reduced susceptibility to each of these PIs. **V32A** is a highly unusual mutation at this position.

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: K70R • M184V • K219Q
NNRTI Mutations: K101H • Y181C • H221Y • F227I
RT Other Mutations: K11T • G18D • K20* • V21E • K22E • Q23L • W24* • P25A • L34Y • V35L • T39K • E40D • E53G • P55S • K64W • S68T • T69A • V75L • D76Y • R78P • K102E • K103* • K122E • D123S • K126* • S134R • G141L • N147Y • Q151A • K173S • D177Y • V179I • D185Y • G190R • L193I • T200S • K201X • I202V • Q207A • F214L • D218R • W229G • M230W • Δ232 • L234V • H235S • P236S • V245H • L246M • Δ247 • E248X • K249D • D250E • S251D • W252S • T253G • V254P • N255S • D256* • I257N • Q258T • K259A • L260I • V261A • K263I • W266C • S268R • Y271* • A272S • G273S

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

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

RT comments

NRTI

- **K70R** is a TAM that confers intermediate resistance to AZT and contributes to reduced ABC and TDF susceptibility in combination with other TAMs.
- **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.
- **K219E/Q/N/R** are accessory TAMS that usually occur in combination with multiple other TAMs.

NNRTI

- **K101H** is a non-polymorphic accessory mutation selected by NVP, EFV and ETR. When present with other NNRTI-resistance mutations, it contributes reduces susceptibility to these NNRTIs.
- **Y181C** is a non-polymorphic mutation selected in persons receiving NVP, ETR and RPV. It confers high-level resistance to NVP, intermediate resistance to ETR and RPV, and low-level resistance to EFV. It does not significantly reduce DOR susceptibility.
- **H221Y** is a non-polymorphic accessory mutation selected primarily by NVP, RPV, and DOR. It frequently occurs in combination with Y181C.
- F227L is a non-polymorphic mutation that usually occurs in combination with V106A. It is selected in vivo and in vitro with both NVP and DOR. In this context it is associated with high-level reductions in NVP and DOR susceptibility and intermediate reductions in EFV susceptibility. **F227I/V** are extremely rare mutations that have been selected in vitro by DOR.

Other

- **T69N/S/A/I/E** are relatively non-polymorphic mutations weakly selected in persons receiving NRTIs. They may minimally contribute reduced AZT susceptibility.
- Q151M causes intermediate/high-level resistance to AZT and ABC, and low-level resistance to TDF, 3TC and FTC. In combination with two or more accessory mutations at positions 62, 75, 77, and 116, it confers high-level resistance to AZT and ABC and intermediate resistance to TDF, 3TC and FTC. Q151L is an extremely rare transitional mutation that may precede the emergence of the Q151M. **Q151A** is a highly unusual mutation at this position.
- **V179I** is a polymorphic mutation that is frequently selected in persons receiving ETR and RPV. However, it has little, if any, direct effect on NNRTI susceptibility.
- M230L is an uncommon non-polymorphic mutation selected in persons receiving EFV, NVP, and RPV. It causes intermediate to high-level resistance to each of the NNRTIs. M230I is a rare mutation selected by RPV. Its effects on NNRTI susceptibility have not been well studied. It also often occurs as a result of APOBEC-mediated G-to-A hypermutation resulting in viruses that are likely to be noninfectious. **M230W** is a highly unusual mutation at this position.
- P236L is a rare mutation selected commonly by DLV, which appears to have little if any effect on current NNRTIs. **P236S** is a highly unusual mutation at this position.

Mutation scoring: RT

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Drug resistance mutation scores of NRTI: Download CSV

Rule	ABC	AZT	D4T	DDI	FTC	3TC	TDF
K70R	5	30	15	10	0	0	5
M184V	15	-10	-10	10	60	60	-10
K219Q	5	10	10	5	0	0	5
Total	25	30	15	25	60	60	0

Drug resistance mutation scores of NNRTI: Download CSV

Rule	DOR	EFV	ETR	NVP	RPV
Y181C	10	30	30	60	45
Y181C + H221Y	10	0	0	0	10
H221Y	10	10	10	15	15
F227I	60	10	0	30	0
K101H	0	10	10	15	10
Total	90	60	50	120	80