



# ViroSeq® HIV-1 Antiretroviral Drug Resistance Report v3.0

## HIV-1 Resistance Mutation List:

NRTI Class	Mutations Included within the Algorithm
EPIVIR® (lamivudine, 3TC)	<p><b>{M184V,M184I**}</b>  <b>[69ins**,K65R,Q151M]</b>            (V75I*,69del***,K65N***,K219Q,K219R***,L210W,D67T***,D67S***,D67N*,Q151L***,D67E,D67H***,D67G***,K70T***,A62V,T215Y,F116Y,M41L,F77L,K219E,K70E***,67del***,K70G***,K70Q***,K70R,K70S***,K219N***,K70N***,T215F)</p>
EMTRIVA® (emtricitabine, FTC)	<p><b>{M184V,M184I**}</b>  <b>[69ins**,K65R,Q151M]</b>            (V75I*,69del***,K65N***,K219Q,K219R***,L210W,D67T***,D67S***,D67N*,Q151L***,D67E,D67H***,D67G***,K70T***,A62V,T215Y,F116Y,M41L,F77L,K219E,K70E***,67del***,K70G***,K70Q***,K70R,K70S***,K219N***,K70N***,T215F)</p>
VIDEX® (didanosine, ddl)	<p><b>{K65R,L74I***,L74V,Q151M,69ins**}</b>  <b>[K65N***,69del***,Q151L***,67del***,V75M***,T69D,K70E***,K70G***,V75T***]</b>            (K219Q,K219R***,A62V,T215S***,F116Y,T215Y,T215V***,M41L,T215L***,T215N***,T215E***,T215D***,T215C***,T215I***,T215F,V75I*,T69A***,T215A***,V75S***,L210W,D67T***,D67S***,D67N*,T69N***,V75A***,D67E,T69S***,D67H***,D67G***,K70T***,M184V,F77L,K219E,M184I**,K70Q***,K70R,K70S***,K219N***,K70N***)</p>
ZERIT® (stavudine, d4T)	<p><b>{Q151M,T215Y,T215F,69ins**,V75M***,V75T***}</b>  <b>[K65R,69del***,Q151L***,T215S***,T215V***,T215L***,67del***,T215N***,T215E***,T215D***,T215C***,T215I***,T215A**,* ,V75S***,V75A***,K70E***,K70R]</b>            (K65N***,K219Q,K219R***,A62V,F116Y,M41L,V75I*,T69A***,T69D,L210W,D67T***,D67S***,D67N*,T69N***,D67E,T69S**,* ,D67H***,D67G***,K70T***,F77L,K219E,K70Q***,K70S***,K219N***,K70N***)  <b>&lt;M184V,M184I**&gt;</b></p>
ZIAGEN® (abacavir, ABC)	<p><b>{69ins**,K65R,Q151M,Y115F*}</b>  <b>[L74I***,69del***,K65N***,L74V,Q151L***,K70E***,67del***,K70G***]</b>            (V75I*,T215A***,K219Q,K219R***,L210W,D67T***,D67S***,D67N*,D67E,D67H***,D67G***,K70T***,M184V,A62V,T215S**,* ,T215Y,F116Y,T215V***,M41L,T215L***,F77L,K219E,T215N***,V75T***,T215E***,M184I**,T215D***,K70Q***,T215C***,K70R,K70S***,T215I***,K219N***,K70N***,T215F)</p>
VIREAD® (tenofovir, TDF)	<p><b>{69ins**,K65R}</b>  <b>[K65N***,Q151M,K70E***,K70G***]</b>            (V75I*,L74I***,69del***,T215A***,K219Q,K219R***,L210W,D67T***,D67S***,D67N*,Q151L***,D67E,D67H***,D67G***,K70T***,A62V,T215S***,T215Y,F116Y,T215V***,M41L,T215L***,F77L,K219E,T215N***,67del***,T215E***,T215D***,K70Q***,T215C***,K70R,K70S***,Y115F*,T215I***,K219N***,K70N***,T215F)  <b>&lt;M184V,M184I**&gt;</b></p>
RETROVIR® (zidovudine, ZDV)	<p><b>{69ins**,Q151M,T215Y,T215F}</b>  <b>[T215A***,Q151L***,T215S***,T215V***,T215L***,T215N***,67del***,T215E***,T215D***,T215C***,K70R,T215I***]</b>            (V75I*,T69A***,K219Q,T69D,K219R***,L210W,D67T***,D67S***,D67N*,T69N***,D67E,D67H***,T69S***,D67G***,A62V,F116Y,M41L,F77L,K219E,K219N***)  <b>&lt;K65R,K65N***,M184V,K70E***,M184I**&gt;</b></p>
NNRTI Class	Mutations Included within the Algorithm
INTELENCE® (etravirine, ETR)	<p><b>{Y181V***,Y181I*}</b>  <b>[M230L***,L100I*,K101P***,G190Q***,F227C***,Y181C,G190E***]</b>            (E138G***,V106I***,H221Y***,E138A***,V179D***,V179E***,V179F***,Y188L**,M230I***,E138K***,V179L***,V179T***,K101H***,L100V***,A98G***,K101E*,G190T***,G190S*,G190V***,E138R***,G190A*,E138Q***,V90I***,G190C***)</p>



# ViroSeq® HIV-1 Antiretroviral Drug Resistance Report v3.0

## NNRTI Class Mutations Included within the Algorithm

### SUSTIVA® (efavirenz, EFV)

{V106M\*\*\*,Y188L\*\*,K103N,K101P\*\*\*,Y188C\*\*,K103S\*\*\*,G190Q\*\*\*,K103H\*\*\*,G190T\*\*\*,G190S\*,G190V\*\*\*,G190C\*\*\*,G190E\*\*\*}  
 [M230L\*\*\*,Y181V\*\*\*,V106A\*\*,Y188H\*\*\*,L100I\*,K103T\*\*\*,P225H\*\*\*,F227C\*\*\*,K238T\*\*\*,Y181I\*,G190A\*,Y181C]  
 (E138G\*\*\*,V106I\*\*\*,H221Y\*\*\*,V179D\*\*\*,V108I\*,V179E\*\*\*,V179F\*\*\*,M230I\*\*\*,E138K\*\*\*,V179L\*\*\*,K101Q\*\*\*,V179T\*\*\*,K101H\*\*\*,L100V\*\*\*,A98G\*\*\*,Y318F\*\*\*,K238N\*\*\*,F227L\*\*\*,K101E\*,E138R\*\*\*,E138Q\*\*\*,V90I\*\*\*)

### VIRAMUNE® (nevirapine, NVP)

{M230L\*\*\*,Y181V\*\*\*,V106M\*\*\*,Y188L\*\*,V106A\*\*,Y188H\*\*\*,K103N,K101P\*\*\*,Y188C\*\*,K103T\*\*\*,K103S\*\*\*,G190Q\*\*\*,K103H\*\*\*,G190T\*\*\*,G190S\*,F227C\*\*\*,G190V\*\*\*,Y181I\*,G190A\*,G190C\*\*\*,G190E\*\*\*,Y181C}  
 [M230I\*\*\*,L100I\*,Y318F\*\*\*,P225H\*\*\*,F227L\*\*\*,K101E\*,K238T\*\*\*]  
 (E138G\*\*\*,V106I\*\*\*,H221Y\*\*\*,V179D\*\*\*,V108I\*,V179E\*\*\*,V179F\*\*\*,E138K\*\*\*,V179L\*\*\*,K101Q\*\*\*,V179T\*\*\*,K101H\*\*\*,L100V\*\*\*,A98G\*\*\*,K238N\*\*\*,E138R\*\*\*,E138Q\*\*\*,V90I\*\*\*)

### EDURANT® (rilpivirine, RPV)

{Y181V\*\*\*,Y188L\*\*,K101P\*\*\*,F227C\*\*\*,Y181I\*}  
 [M230L\*\*\*,M230I\*\*\*,E138K\*\*\*,L100I\*,G190Q\*\*\*,Y181C,G190E\*\*\*]  
 (E138G\*\*\*,V106I\*\*\*,H221Y\*\*\*,E138A\*\*\*,V179D\*\*\*,V179E\*\*\*,V179F\*\*\*,V179L\*\*\*,V179T\*\*\*,K101H\*\*\*,L100V\*\*\*,A98G\*\*\*,K101E\*,G190T\*\*\*,G190S\*,G190V\*\*\*,E138R\*\*\*,G190A\*,E138Q\*\*\*,V90I\*\*\*,G190C\*\*\*)

## PI Class Mutations Included within the Algorithm

### APTIVUS® (tipranavir, TPV)

[I84V,V82L\*\*\*,I84A\*\*\*,V82T]  
 (V82M\*\*,V32I\*,V82C\*\*\*,L90M,V82F\*\*,L33F\*,I54A\*\*\*,I47V\*,L10I,K43T\*\*\*,I54S\*\*\*,T74P\*\*\*,I54V,L10R\*\*,I54T\*,A71L\*\*\*,I84C\*\*,\*Q58E\*\*\*,L10V\*,I47A\*\*\*,A71V,I54M\*\*\*,L10Y\*\*\*,A71T\*,V82S\*\*,M46L\*,A71I\*\*\*,N83D\*\*\*,M46I)  
 <L76V\*\*\*,L24I\*\*\*,I50L\*\*\*,I54L\*\*\*,I50V\*\*\*>

### CRIXIVAN® (indinavir, IDV)

{I84A\*\*\*}  
 [I84V,L90M,I84C\*\*\*,V82T,V82S\*\*,L76V\*\*\*,V82M\*\*,V82A,V82C\*\*\*,V82F\*\*]  
 (M46V\*\*\*,G48A\*\*\*,V32I\*,G73A\*\*\*,F53L\*,I54A\*\*\*,L24I\*\*\*,I47V\*,L10I,L10F\*,I54S\*\*\*,I54V,T74P\*\*\*,I54T\*,I54M\*\*\*,I54L\*\*\*,G48T\*\*\*,G48S\*\*\*,G48V,M46L\*,G48Q\*\*\*,G48L\*\*\*,G48M\*\*\*,M46I,N83D\*\*\*,V82L\*\*\*,N88S\*\*\*,G73T\*\*\*,G73S\*,L10R\*\*,A71L\*\*\*,L10V\*,I47A\*\*\*,A71V,L10Y\*\*\*,A71T\*,G73C\*\*\*,A71I\*\*\*)  
 <I50L\*\*\*>

### FORTOVASE® / INVIRASE® (saquinavir, SQV)

{I84V,G48A\*\*\*,I84C\*\*\*,I84A\*\*\*,G48T\*\*\*,G48S\*\*\*,G48V,G48Q\*\*\*,G48L\*\*\*,G48M\*\*\*}  
 [L90M]  
 (V82A,V82C\*\*\*,G73A\*\*\*,V82F\*\*,F53L\*,L24I\*\*\*,I54A\*\*\*,L10I,I54S\*\*\*,G73T\*\*\*,T74P\*\*\*,G73S\*,I54V,L10R\*\*,I54T\*,A71L\*\*\*,L10V\*,A71V,I54M\*\*\*,A71T\*,L10Y\*\*\*,I54L\*\*\*,V82T,V82S\*\*,G73C\*\*\*,M46L\*,A71I\*\*\*,N83D\*\*\*,M46I)  
 <L76V\*\*\*,I50L\*\*\*,I47A\*\*\*>

### KALETRA® (lopinavir + ritonavir, LPV)

{I47A\*\*\*}  
 [I84A\*\*\*,I50V\*\*,L76V\*\*\*]  
 (M46V\*\*\*,I84V,G48A\*\*\*,V32I\*,L90M,G73A\*\*\*,F53L\*,L33F\*,I54A\*\*\*,L24I\*\*\*,I47V\*,L10I,L10F\*,I54S\*\*\*,I54V,T74P\*\*\*,I54T\*,I84C\*\*\*,I54M\*\*\*,I54L\*\*\*,V82T,G48T\*\*\*,V82S\*\*,G48S\*\*\*,G48V,M46L\*,G48Q\*\*\*,G48L\*\*\*,G48M\*\*\*,M46I,N83D\*\*\*,V82M\*\*,V82L\*\*\*,V82A,V82C\*\*\*,V82F\*\*,G73T\*\*\*,G73S\*,L10R\*\*,A71L\*\*\*,L10V\*,A71V,L10Y\*\*\*,A71T\*,G73C\*\*\*,A71I\*\*\*)  
 <I50L\*\*\*>

### PREZISTA® (darunavir, DRV)

(V11I\*\*\*,L76V\*\*\*,G73T\*\*\*,I84V,T74P\*\*\*,G73S\*,I84C\*\*\*,V32I\*,I84A\*\*\*,L89V\*\*\*,I47A\*\*\*,G73A\*\*\*,I54M\*\*\*,V82F\*\*,L33F\*,I54L\*\*,\*I50V\*\*\*,I47V\*,G73C\*\*\*,L10F\*)  
 <I50L\*\*\*,N88S\*\*\*>



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## PI Class Mutations Included within the Algorithm

### REYATAZ® (atazanavir, ATV)

{I84V,I84C\*\*\*,I50L\*\*\*,I84A\*\*\*,N88S\*\*\*}

[G48A\*\*\*,G48T\*\*\*,G48S\*\*\*,G48V,G48Q\*\*\*,G48L\*\*\*,G48M\*\*\*]

(M46V\*\*\*,V32I\*,L90M,G73A\*\*\*,F53L\*,L33F\*,I54A\*\*\*,L24I\*\*\*,L10I,I54S\*\*\*,N88G\*\*\*,I54V,T74P\*\*\*,I54T\*,I54M\*\*\*,I54L\*\*\*,V82T,V82S\*\*,M46L\*,M46I,N83D\*\*\*,V82M\*\*,V82L\*\*\*,V82A,V82C\*\*\*,V82F\*\*,N88T\*\*\*,G73T\*\*\*,G73S\*,L10R\*\*,A71L\*\*\*,L10V\*,A71V,L10Y\*\*\*,A71T\*,G73C\*\*\*,A71I\*\*\*)

<L76V\*\*\*>

### VIRACEPT® (nelfinavir, NFV)

{I84V,L90M,D30N,I84C\*\*\*,I84A\*\*\*,N88D\*,N88S\*\*\*}

[G48A\*\*\*,I54A\*\*\*,N88G\*\*\*,I54S\*\*\*,I54V,I54T\*,I54M\*\*\*,I54L\*\*\*,V82T,G48T\*\*\*,L23I\*\*\*,V82S\*\*,G48S\*\*\*,G48V,M46L\*,G48Q\*\*\*,G48L\*\*\*,G48M\*\*\*,M46I,V82A,V82C\*\*\*,V82F\*\*,N88T\*\*\*]

(M46V\*\*\*,V32I\*,K20T\*\*\*,G73A\*\*\*,L24I\*\*\*,I47V\*,L10I,L10F\*,T74P\*\*\*,N83D\*\*\*,V82M\*\*,V82L\*\*\*,G73T\*\*\*,G73S\*,L10R\*\*,A71L\*\*\*,L10V\*,I47A\*\*\*,A71V,L10Y\*\*\*,A71T\*,G73C\*\*\*,A71I\*\*\*)

<I50L\*\*\*>

### LEXIVA® (fosamprenavir, FPV)

{L76V\*\*\*,I84V,I84C\*\*\*,I84A\*\*\*,I47A\*\*\*,I54M\*\*\*,I54L\*\*\*,I50V\*\*}

[V82F\*\*,I47V\*]

(M46V\*\*\*,V11I\*\*\*,V82M\*\*,V82L\*\*\*,V82A,V32I\*,V82C\*\*\*,L90M,G73A\*\*\*,L33F\*,I54A\*\*\*,L10I,L10F\*,I54S\*\*\*,G73T\*\*\*,T74P\*\*\*,G73S\*,I54V,L10R\*\*,I54T\*,A71L\*\*\*,L10V\*,L89V\*\*\*,A71V,L10Y\*\*\*,A71T\*,V82T,V82S\*\*,G73C\*\*\*,M46L\*,A71I\*\*\*,N83D\*\*\*,M46I)

<N88S\*\*\*,I50L\*\*\*>

## Mutation Notations Key:

{Red Bold Curly Bracket}

Presence of this mutation alone confers viral resistance

[Blue Bold-Italics Square Bracket]

Presence of this mutation alone confers the possibility of viral resistance

(Black Parenthesis)

This mutation must appear with at least one other mutation to confer the possibility of viral resistance

<Green Angle Bracket>

This mutation counters resistance

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NOTE: This mutation has not been fully validated

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NOTE: This mutation has not been clinically verified

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NOTE: For this mutation, both notes above apply

## References:

1. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Department of Health and Human Services. Available at <http://aidsinfo.nih.gov/contentfiles/lvguidelines/AdultandAdolescentGL.pdf>.
2. M Boffito, E Acosta, D Burger, CV Fletcher, C Flexner, R Garaffo, G Gatti, M Kurowski, CF Perno, G Paytavin, M Regazzi and D Back. Current status and future prospects of therapeutic drug monitoring and applied clinical pharmacology in antiretroviral therapy. Antiviral Therapy, 2005, 10:375-392
3. N Shulman, A Zolopa, D Havir, A Hsu, C Renz, S Boller, P Jiang, R Rode, J Gallant, E Race, DJ Kempf and E Sun. Virtual inhibitory quotient predicts response to ritonavir boosting of indinavir-based therapy in human immunodeficiency virus-infected patients with ongoing viremia. Antimicrobial Agents Chemotherapy, 2002,46:3907-3916