



# CMV Resistance Sequencing

TEST CODES:  
33125, 33126,  
30722

CPT CODE:  
87910 (with Multiplier)

CATEGORY  
Infectious Disease

## Reportable Mutations - UL54 (DNA Polymerase)<sup>1</sup>

Viral Phenotype Confirmed by Marker Transfer <sup>2</sup>				
Mutation	Cidofovir	Foscarnet	Ganciclovir	REFERENCE
S290R	S	R	S	106
D301N	R	S	R	19,33,56
E303D <sup>4</sup>	R	S	R	93
E303G <sup>4</sup>	R	S	R	93
N408D	R	S	R	9,12,23,31,33,35,56,72
N408K <sup>4</sup>	R	S	R	13,74,93
N408S	R	S	R	84,88
N410K	R	S	R	19,23
F412C	R	S	R	9,20,23,33,35,65,72
F412L	R	S	R	74,111
F412S	R	S	R	25,74,111
F412V	R	S	R	9,23,72
D413A	R	S	R	69,73
D413E	R	S	R	19,23,31,33,52,56,69,72,73
D413N	R	S	R	89
D413Y <sup>4</sup>	R	S	R	93
P488R	R	S	R	79,111
K493N	R	R	R	118
N495K	S	R	S	73,76,106
P497S	R	S	S	118
K500N	R	S	R	79,11
L501I	R	S	R	2,9,12,23,33,64,72
T503I	R	S	R	12,19,33,35,72,73
K513N	R	S	R	23,33,35,56,72
K513E	R	S	R	9,23,33,34,35,72
K513R	R	S	R	35,72,89
K513T	R	S	R	118
D515E	S	S	R	90
D515Y	R	S	R	91,120
L516P	R	S	R	120
L516R	R	S	R	19,33
L516W	R	S	R	92

<sup>1</sup> Most UL54 mutations also have UL97 mutations.

<sup>2</sup> R and S denote resistant and sensitive, respectively. ND indicates Not Determined.

<sup>3</sup> Low-grade or variable resistance.

<sup>4</sup> Also confers resistance to CMX001.

## Reportable Mutations - UL54 (DNA Polymerase)<sup>1</sup>

Viral Phenotype Confirmed by Marker Transfer <sup>2</sup>				
Mutation	Cidofovir	Foscarnet	Ganciclovir	REFERENCE
I521T	R	S	R	66,68,72
P522A	R	S	R	33,37,68,72
P522S	R	S	R	68,72
del524	R	S	R	88
V526L	R	S	R	82
C539G	R	S	R	89
C539R	R	S	R	79,111
D542E <sup>4</sup>	R	S	S	81
A543P	R	S	R	108
L545S	R	S	R	9,12,33,72
L545W	R	S	R	74,111
T552N	S	R	R	79,106,111
L565V	S	R	S	118
Q578H	R	R	R	24,74,111
Q578L	S	R	S	83
S585A	S	R	S	79,111
D588E	S	R	S	9,12,23,35,72
D588N	S	R	R	12,23,27,33,74
F595I	S	R	S	79,111
T700A	S	R	S	5,9,18,33,47,72
V715A	S	R	S	92
V715M	S	R	S	5,9,18,25,33,37,47,72,92
I726T	S	S	R	83
E756K	R or S <sup>3</sup>	R	R	12,19,23,33,36,74, 82,110
E756D	S	R	S	12,19,31,33
E756Q	S	R	S	12,18,33,37
L773V	R	R	R	24,89
L776M	S	R	R	67,73
V781I	S	R	R <sup>3</sup>	9,23,74
V787A	S	R	R	91
V787L	S	R	R	18,37,48,73
L802M	S	R	R or S <sup>3</sup>	9,12,18,20,23,27,33,35,65,73
K805Q	R	S	S	9,18,28,35,72
A809V	S	R	R	18,25,28,33,47,72,106
V812L <sup>4</sup>	R	R	R	12,18,20,27,28,33,72,73,78,93
T813S	R	R	R	28,73
T821I	S	R	R	9,18,28,33,35,72,73
V823A	R	S	R	118
P829S	S	S	R	79,111

<sup>1</sup> Most UL54 mutations also have UL97 mutations.

<sup>2</sup> R and S denote resistant and sensitive, respectively. ND indicates Not Determined.

<sup>3</sup> Low-grade or variable resistance.

<sup>4</sup> Also confers resistance to CMX001.

## Reportable Mutations - UL54 (DNA Polymerase)<sup>1</sup>

Viral Phenotype Confirmed by Marker Transfer <sup>2</sup>				
Mutation	Cidofovir	Foscarnet	Ganciclovir	REFERENCE
A834P	R	R	R	13,73
T838A	S	R	S	27,28,73
G841A	R	R	R	28,72,73
G841S	S	R	R	83
V946L	S	R	S	79,111
E951D	S	R	R	106
L957F	ND	ND	R	79,111
del981 to 982	R	R	R	11,19,33,63,72,73,108
A987G	R	S	R	1,9,22,23,25,43,72
A987V	S	R	S	118
E989D	S	R	R	118
N495K+Q783R	S	R	R	106

## Reportable Mutations - UL54 (DNA Polymerase)<sup>1</sup>

Viral Phenotype found in Clinical Isolates (Unconfirmed by Marker Transfer) <sup>2</sup>				
Mutation	Cidofovir	Foscarnet	Ganciclovir	REFERENCE
M393R	R	R	R	20,72
M393K	R	R	R	20,72
T419M	S	R	S	24
L501F	R	S	R	23,25,31,56,72
Y(I)722V	R	S	R	35,72
H729Y	S	R	S	115
Y751H	R	S	R	35,72
V787I	S	R	S	33

<sup>1</sup> Most UL54 mutations also have UL97 mutations.

<sup>2</sup> R and S denote resistant and sensitive, respectively. ND indicates Not Determined.

<sup>3</sup> Low-grade or variable resistance.

<sup>4</sup> Also confers resistance to CMX001.

## Reportable Mutations - UL56 (Terminase)

Viral Phenotype Confirmed by Marker Transfer <sup>1</sup>		
Mutation	Letermovir	REFERENCE
S229F	R	104
V231A	R	102
V231L	R	98,102,104,108
N232Y	R	105
V236A	R	108
V236L	R	102
V236M	R	97,98,104,110
E237D	R	102,105
L241P	R	98,102,103,104
T244K	R	102
L254F	R	104
L257F	R	104
L257I	R	102,104
K258E	R	105
F261L	R	102,104,105
Y321C	R	102
C325F	R	102
C325W	R	108
C325R	R	102
C325Y	R	98,102
M329T	R	102,105
A365S	R	108
N368D	R	104
R369G	R	98
R369M	R	98,104
R369S	R	98,103
E237D, T244K, F261L	R	102
V236L, L257I	R	102
V236M, L257I, M329T	R	102
S229F, L254F, L257I	R	104

<sup>1</sup> R denotes resistance.

## Reportable Mutations - UL97 (Phosphotransferase)

Viral Phenotype Confirmed by Marker Transfer <sup>1</sup>			
Mutation	Maribavir	Ganciclovir	REFERENCE
F342S	ND	R	94,95,96
F342Y	R	R	112,114
V356G	ND	R	95,96
K359E	ND	R	112,114
K359Q	ND	R	112,114
K359N	ND	R	114,116
E362D	ND	R	116
L405P	ND	R	75
T409M	R	ND	114,119
H411L	R	ND	117,118
H411N	R	ND	117
H411Y	R	ND	114,117
M460I	ND	R	3,5,6,7,8,10,12,23,25,33,109
M460T	ND	R	75,109
M460V	ND	R	6,7,8,10,11,17,24,33,43,50,109
V466G	R	R	73,77,96
C480F	R	R	112,118
C518Y	ND	R	84,85
H520Q	ND	R	6,7,10,25,33,43,109
P521L	R	R	96,112
del590 to 593	ND	R	12,72
del591 to 594	ND	R	8,10,33,34,35,72,107
del591 to 607	ND	R	51,72
A591V	ND	R	107
C592G	ND	R <sup>2</sup>	6,8,10,11,20,23,27,33,51,106,107,109,114
A594E	ND	R	73,75
A594G	ND	R	84,86
A594P	ND	R	6,25,59,72
A594T	ND	R	10,25,33,36,50,51,54,92
A594V	ND	R	5,6,8,10,11,17,25,27,33,50,107,109,113
A594S	ND	R	113
L595F	ND	R	10,33,41,72
L595S	ND	R	5,6,8,10,11,12,17,23,25,33,109
L595W	ND	R	6,10,25,33,51,72
del595	ND	R	4,10,17,72,107
del595 to 603	ND	R	14,33,48,72,107
del596	ND	R	107
E596G	ND	R	10,20,33,35,36,51,72
E596Y	ND	R	90
del597 to 599	ND	R	92,107

<sup>1</sup> R denotes resistance. ND indicates Not Determined.

<sup>2</sup> Alone confers modest resistance. When found in conjunction with UL54 del 981 to 982, there is a much higher level of resistance.

## Reportable Mutations - UL97 (Phosphotransferase)

Viral Phenotype Confirmed by Marker Transfer <sup>1</sup>			
Mutation	Maribavir	Ganciclovir	REFERENCE
del597 to 598	ND	R	107
G598S	ND	R	33,58,72
del599	ND	R	107
k599T	ND	R	60,72
del600	ND	R	10,33,36,51,72,107
del600-601	ND	R	107
del601	ND	R	107
del601-602	ND	R	107
del601 to 603	ND	R	69,107
C603R	ND	R	73,77,109
C603W	ND	R	6,8,10,20,23,25,33,35,72,109
C607F	ND	R	8,50,51,72
C607Y	ND	R	10,25,33,34,35,39,51,72
I610T	ND	R	90
A613V	ND	R	84,87

<sup>1</sup> R denotes resistance. ND indicates Not Determined.

<sup>2</sup> Alone confers modest resistance. When found in conjunction with UL54 del 981 to 982, there is a much higher level of resistance.

## Reportable Mutations - UL97 (Phosphotransferase)

Viral Phenotype found in Clinical Isolates (Unconfirmed by Marker Transfer) <sup>1</sup>			
Mutation	Maribavir	Ganciclovir	REFERENCE
M460L	ND	R	49,72
A590T	ND	R	10,49,72
del590 to 600	ND	R	17,72
del590 to 603	ND	R	56,72
A591D	ND	R	10,49,72
C592F	ND	R	72
del594 to 601	ND	R	unpublished clinical isolate
L595T	ND	R	10,35,72
N597I	ND	R	10,49,72
del597 to 603	ND	R	25
G598V	ND	R	10,49,72
K599M	ND	R	10,49,72
C603Y	ND	R	6,10,49,72
A606D	ND	R	10,49,72

<sup>1</sup> R denotes resistance. ND indicates Not Determined.

<sup>2</sup> Alone confers modest resistance. When found in conjunction with UL54 del 981 to 982, there is a much higher level of resistance.

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