

3004509: Cytomegalovirus Drug Resistance by Next Generation Sequencing, Letermovir

EVALUATED MUTATIONS

Gene	Variant	Cidofovir	Foscarnet	Ganciclovir	Maribavir	Letermovir	Confirmed by Phenotyping	References
UL56	A365S	-	-	-	-	R	Y	131, 138
UL56	C25F	-	-	-	-	R	Y	131
UL56	C325F	-	-	-	-	R	Y	128
UL56	C325R	-	-	-	-	R	Y	128
UL56	C325W	-	-	-	-	R	Y	128, 131
UL56	C325Y	-	-	-	-	R	Y	109, 112
UL56	E237D	-	-	-	-	R	Y	125, 128
UL56	E237G	-	-	-	-	R	Y	128
UL56	F261C	-	-	-	-	R	Y	128
UL56	F261L	-	-	-	-	R	Y	124, 125, 128
UL56	F261S	-	-	-	-	R	Y	128
UL56	K258E	-	-	-	-	R	Y	125
UL56	L241P	-	-	-	-	R	Y	94, 109, 112, 124
UL56	L254F	-	-	-	-	R	Y	124, 138
UL56	L257F	-	-	-	-	R	Y	124, 138
UL56	L257I	-	-	-	-	R	Y	124, 128
UL56	L328V	-	-	-	-	R	Y	131, 138
UL56	M329T	-	-	-	-	R	Y	125, 128
UL56	N232Y	-	-	-	-	R	Y	125
UL56	N368D	-	-	-	-	R	Y	124, 138
UL56	Q204R	-	-	-	-	P	Y	125
UL56	R369G	-	-	-	-	R	Y	109
UL56	R369M	-	-	-	-	R	Y	109, 124
UL56	R369S	-	-	-	-	R	Y	94, 109
UL56	R369T	-	-	-	-	R	Y	134, 138
UL56	S229F	-	-	-	-	R	Y	124, 138
UL56	T244K	-	-	-	-	R	Y	124, 128
UL56	T244R	-	-	-	-	R	Y	128
UL56	V231A	-	-	-	-	R	Y	128
UL56	V231L	-	-	-	-	R	Y	109, 112, 124, 131
UL56	V236A	-	-	-	-	R	Y	131, 138
UL56	V236L	-	-	-	-	R	Y	128

Gene	Variant	Cidofovir	Foscarnet	Ganciclovir	Maribavir	Letermovir	Confirmed by Phenotyping	References
UL56	V236M	-	-	-	-	R	Y	109, 122, 124, 129
UL56	Y321C	-	-	-	-	R	Y	128

* = stop codon

del = deletion

R = "Resistant". Resistant indicates evidence of drug resistance compared with a wild-type virus.

P = "Possible Resistance". Possible resistance indicates mutations were detected with borderline-level drug resistance or conflicting resistance status reported in the literature.

S = "Sensitive". Ignored by the plugin and reported as additional variant.

'-' = No known resistance-association or phenotypically confirmed sensitivity to specified drug. Ignored by the plugin.

Y = "Yes". Mutation's resistance profile was confirmed by marker transfer/phenotyping experiments.

N = "No". Mutation's resistance profile has not been confirmed by marker transfer/phenotyping experiments.

REFERENCES

1. Lurain NS et al. 1992. J Virol. [PMID:1331515](#)
2. Sullivan V et al. 1993. Antimicrob Agents Chemother. [PMID:8381637](#)
3. Lurain NS et al. 1994. J Virol. [PMID:8207815](#)
4. Baldanti F et al. 1995. J Virol. [PMID:7815545](#)
5. Wolf DG et al. 1995. J Clin Invest. [PMID:7814623](#)
6. Baldanti F et al. 1996. J Virol. [PMID:8627655](#)
7. Kimberlin DW et al. 1996. J Antimicrob Chemother. [PMID:9182098](#)
8. Bourgeois C et al. 1997. J Virol Methods. [PMID:9300382](#)
9. Chou S et al. 1997. J Infect Dis. [PMID:9291334](#)
10. Erice A et al. 1997. J Infect Dis. [PMID:9129070](#)
11. Smith IL et al. 1998. Arch Ophthalmol. [PMID:9488269](#)
12. Baldanti F et al. 1998. J Infect Dis. [PMID:9498475](#)
13. Baldanti F et al. 1998. Antimicrob Agents Chemother. [PMID:9527804](#)
14. Cherrington JM et al. 1998. J Infect Dis. [PMID:9815243](#)
15. Chou S et al. 1998. J Infect Dis. [PMID:9697736](#)
16. Cihlar T et al. 1998. Virology. [PMID:9721246](#)
17. Cihlar T et al. 1998. J Virol. [PMID:9621055](#)
18. Erice A et al. 1998. J Infect Dis. [PMID:9697737](#)
19. Harada K et al. 1997. Arch Virol. [PMID:9125039](#)
20. Gilbert C et al. 1998. AIDS. [PMID:9468360](#)
21. Jabs DA et al. 1998. Antimicrob Agents Chemother. [PMID:9736542](#)
22. Smith IL et al. 1998. Arch Ophthalmol. [PMID:9488269](#)
23. Wolf DG et al. 1998. J Infect Dis. [PMID:9697738](#)
24. Chou S et al. 1999. Antimicrob Agents Chemother. [PMID:10348781](#)
25. Erice A. 1999. Clin Microbiol Rev. [PMID:10194460](#)
26. Michel D et al. 1999. J Virol. [PMID:10482650](#)
27. Prix L et al. 1999. J Infect Dis. [PMID:10395867](#)
28. Chou S et al. 2000. J Infect Dis. [PMID:11069251](#)
29. Chou S et al. 2000. Antimicrob Agents Chemother. [PMID:10602745](#)
30. Eckle T et al. 2000. Blood. [PMID:11050017](#)
31. Emery VC et al. 2000. Proc Natl Acad Sci U S A. [PMID:10859361](#)

32. Arens M. 2001. J Clin Virol. [PMID:11418349](#)
33. Baldanti F et al. 2001. Antiviral Res. [PMID:11397507](#)
34. Boivin G et al. 2001. J Infect Dis. [PMID:11740736](#)
35. Emery VC. 2001. J Clin Virol. [PMID:11397658](#)
36. Jabs DA et al. 2001. J Infect Dis. [PMID:11120934](#)
37. Lurain NS et al. 2001. Antimicrob Agents Chemother. [PMID:11557468](#)
38. Mousavi-Jazi M et al. 2001. J Clin Virol. [PMID:11595579](#)
39. Seo SK et al. 2001. Clin Infect Dis. [PMID:11577375](#)
40. Wolf DG et al. 2001. Antimicrob Agents Chemother. [PMID:11158760](#)
41. Baldanti F et al. 2002. Clin Infect Dis. [PMID:11915006](#)
42. Biron KK et al. 2002. Antimicrob Agents Chemother. [PMID:12121906](#)
43. Chou S et al. 2002. J Infect Dis. [PMID:11807689](#)
44. Gilbert C et al. 2002. Drug Resist Updat. [PMID:12135584](#)
45. Hu H et al. 2002. J Infect Dis. [PMID:11920309](#)
46. Ijichi O et al. 2002. Antiviral Res. [PMID:11750939](#)
47. Lurain NS et al. 2002. J Infect Dis. [PMID:12198609](#)
48. Marschall M et al. 2002. J Gen Virol. [PMID:11961255](#)
49. Chou S et al. 2003. J Infect Dis. [PMID:12825168](#)
50. Hamprecht K et al. 2003. J Infect Dis. [PMID:12508158](#)
51. Komazin G et al. 2003. Nucleosides Nucleotides Nucleic Acids. [PMID:14565505](#)
52. Komazin G et al. 2003. J Virol. [PMID:14557635](#)
53. Kuo IC et al. 2003. Am J Ophthalmol. [PMID:12504692](#)
54. Mousavi-Jazi M et al. 2003. J Clin Virol. [PMID:12637079](#)
55. Weinberg A et al. 2003. J Infect Dis. [PMID:12599051](#)
56. Baldanti F et al. 2004. Hum Immunol. [PMID:15172438](#)
58. Boivin G et al. 2004. J Infect Dis. [PMID:15116297](#)
59. Chou S et al. 2004. J Virol. [PMID:15194788](#)
60. Ducancelle A et al. 2004. J Clin Virol. [PMID:15018851](#)
61. Evers DL et al. 2004. Antimicrob Agents Chemother. [PMID:15388453](#)
62. Fillet AM et al. 2004. Antimicrob Agents Chemother. [PMID:15105145](#)
63. Loregian A et al. 2004. J Virol. [PMID:14671097](#)
64. Chou S et al. 2005. Antimicrob Agents Chemother. [PMID:15980340](#)

65. Gilbert C et al. 2005. Antimicrob Agents Chemother. [PMID:15728878](#)
66. Gilbert C et al. 2005. Antimicrob Agents Chemother. [PMID:16304146](#)
67. Hantz S et al. 2005. Antimicrob Agents Chemother. [PMID:15793144](#)
68. Prichard MN et al. 2005. J Virol. [PMID:16306620](#)
69. Springer KL et al. 2005. J Clin Microbiol. [PMID:15634973](#)
70. Drew WL et al. 2006. J Clin Virol. [PMID:16962820](#)
71. Ducancelle A et al. 2006. Antivir Ther. [PMID:16856628](#)
72. Gvðhring K et al. 2006. J Clin Microbiol. [PMID:17035493](#)
73. Jabs DA et al. 2006. J Infect Dis. [PMID:16703517](#)
74. Tchesnokov EP et al. 2006. J Virol. [PMID:16415021](#)
75. Castor J et al. 2007. J Clin Microbiol. [PMID:17537934](#)
76. Chou S et al. 2007. J Infect Dis. [PMID:17538888](#)
77. Chou S et al. 2007. Antimicrob Agents Chemother. [PMID:17709468](#)
78. Marfori JE et al. 2007. J Clin Virol. [PMID:17157554](#)
79. Picard-Jean F et al. 2007. Biochem J. [PMID:17672827](#)
80. Scott GM et al. 2007. Antimicrob Agents Chemother. [PMID:17043128](#)
81. Chou S et al. 2008. J Virol. [PMID:17942550](#)
82. Chou S et al. 2008. J Clin Virol. [PMID:18502683](#)
83. Shapira MY et al. 2008. Clin Infect Dis. [PMID:18419454](#)
84. Torres-Madriz G et al. 2008. Clin Infect Dis. [PMID:18652557](#)
85. Chou S. 2009. Antimicrob Agents Chemother. [PMID:18981262](#)
86. Chevillotte M et al. 2010. Antiviral Res. [PMID:19853628](#)
87. Chou S. 2010. Antimicrob Agents Chemother. [PMID:20385869](#)
88. Lurain NS et al. 2010. Clin Microbiol Rev. [PMID:20930070](#)
89. Martin M et al. 2010. J Clin Virol. [PMID:20138805](#)
90. Strasfeld L et al. 2010. J Infect Dis. [PMID:20504236](#)
91. Chou S et al. 2011. Antimicrob Agents Chemother. [PMID:21041510](#)
92. Chou S. 2011. J Clin Virol. [PMID:21295516](#)
93. Gilbert C et al. 2011. Antimicrob Agents Chemother. [PMID:21709106](#)
94. Goldner T et al. 2011. J Virol. [PMID:21752907](#)
95. Hakki M et al. 2011. Curr Opin Infect Dis. [PMID:22001948](#)
96. Chou S et al. 2012. Antimicrob Agents Chemother. [PMID:21968367](#)

97. Chou S et al. 2012. Antiviral Res. [PMID:22664236](#)
98. Marschall M et al. 2012. Antimicrob Agents Chemother. [PMID:22106211](#)
99. Chou S et al. 2013. Antimicrob Agents Chemother. [PMID:23650173](#)
100. Fischer L et al. 2013. Antiviral Res. [PMID:24120366](#)
101. Hantz S et al. 2013. Antiviral Res. [PMID:23415883](#)
102. James SH et al. 2013. Antimicrob Agents Chemother. [PMID:23650158](#)
103. Kotton CN et al. 2018. Transplantation. [PMID:29596116](#)
104. Zhang Y et al. 2013. Arch Virol. [PMID:23011309](#)
105. Chou S et al. 2014. Antimicrob Agents Chemother. [PMID:24379208](#)
106. Chou S et al. 2014. Antimicrob Agents Chemother. [PMID:24890586](#)
107. Chou S et al. 2014. J Infect Dis. [PMID:24273181](#)
108. Drouot E et al. 2014. J Clin Microbiol. [PMID:25143583](#)
109. Goldner T et al. 2014. Antimicrob Agents Chemother. [PMID:24189264](#)
110. Komazin-Meredith G et al. 2014. Antimicrob Agents Chemother. [PMID:24145545](#)
111. Chou S. 2015. Curr Opin Infect Dis. [PMID:26098499](#)
112. Chou S. 2015. Antimicrob Agents Chemother. [PMID:26259791](#)
113. Fischer L et al. 2015. J Clin Virol. [PMID:26209398](#)
114. Gvðhring K et al. 2015. Comput Struct Biotechnol J. [PMID:25750703](#)
115. Goldner T et al. 2015. Antiviral Res. [PMID:25637709](#)
116. Andouard D et al. 2016. Antiviral Res. [PMID:26872863](#)
117. Campos AB et al. 2016. Rev Med Virol. [PMID:26990717](#)
118. Chou S et al. 2016. Antimicrob Agents Chemother. [PMID:27044553](#)
119. Fischer L et al. 2016. Antiviral Res. [PMID:27058773](#)
121. Lanier ER et al. 2016. J Infect Dis. [PMID:26941282](#)
122. Lischka P et al. 2016. J Infect Dis. [PMID:26113373](#)
123. Lischka P et al. 2016. Antiviral Res. [PMID:27345658](#)
124. Chou S. 2017. Antiviral Res. [PMID:29107686](#)
125. Chou S. 2017. Antimicrob Agents Chemother. [PMID:28827420](#)
126. Muller F et al. 1993. Prenat Diagn. [PMID:8446569](#)
127. Chou S. 2017. Antiviral Res. [PMID:27940027](#)
128. Merck. 2017.
https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/209939Orig1s000,209940Orig1s000lbl.pdf
129. Piret J et al. 2017. Antimicrob Agents Chemother. [PMID:28807919](#)

130. Cherrier L et al. 2018. Am J Transplant. [PMID:30286286](#)
131. Chou S et al. 2018. Antimicrob Agents Chemother. [PMID:29914965](#)
132. Kotton CN et al. 2018. Transplantation. [PMID:29596116](#)
133. Chou S et al. 2019. Antiviral Res. [PMID:31568799](#)
134. Douglas MW et al. 2019. J Infect Dis. [PMID:30958539](#)
135. Papanicolaou GA et al. 2019. Clin Infect Dis. [PMID:30329038](#)
136. Piret J et al. 2019. J Infect Dis. [PMID:31199457](#)
137. Wong DD et al. 2019. Antimicrob Agents Chemother. [PMID:31262766](#)
138. Chou S. 2020. Antiviral Res. [PMID:31940472](#)
139. Chou S et al. 2020. J Infect Dis. [PMID:32726419](#)
140. Chou S et al. 2021. Antiviral Res. [PMID:34273445](#)