

Supplements

Genetic variations in the Orf7a protein of SARS-CoV-2 and its possible role in vaccine development

Table 1. Mutational location after MSA of Orf7a of SARS-CoV-2 protein sequence with position and sequence from Africa

| Serial No. | Accession | Mutations |
|------------|-----------|-----------|
| 1. | QWN49776 | V29A |
| 2. | QWN49788 | I3V |
| 3. | QWF10094 | P34S |
| 4. | QWF08578 | S81L |
| 5. | QVI03435 | V93F |
| 6. | QUA12575 | V93F |
| 7. | QTI50472 | T14I |
| 8. | QTI56505 | N43Y |
| 9. | QTI56601 | N43Y |
| 10. | QTI56697 | N43Y |
| 11. | QTI56793 | N43Y |
| 12. | QTI56889 | N43Y |
| 13. | QTI56985 | N43Y |
| 14. | QSW63722 | H47Y |
| 15. | QSW63806 | A106S |
| 16. | QRN78544 | I10V |
| 17. | QRG27546 | Q76H |
| 18. | QRG27546 | A105V |
| 19. | QRG27642 | T14I |
| 20. | QRG28374 | K119N |
| 21. | QQZ91070 | P84S |
| 22. | QRA18276 | T111A |
| 23. | QRA18324 | I88F |
| 24. | QRA18324 | V93F |
| 25. | QQZ90930 | N43Y |
| 26. | QQX29236 | P99L |
| 27. | QQV45120 | P84S |
| 28. | QQW25842 | L96F |
| 29. | QQW39505 | T14I |
| 30. | QQW39517 | T14I |
| 31. | QQW39757 | T111A |
| 32. | QQV30237 | L12P |
| 33. | QQV32408 | N43Y |
| 34. | QQV32420 | N43Y |
| 35. | QQV39551 | T111A |

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| 36. | QQV39647 | P99S |
| 37. | QQV39647 | A105V |
| 38. | QQV39671 | T14I |
| 39. | QQV39767 | L96F |
| 40. | QQV39791 | E22D |
| 41. | QQV39851 | T11I |
| 42. | QQO75757 | P34S |
| 43. | QQN96164 | T14I |
| 44. | QQM99794 | I10L |
| 45. | QQM18334 | T14I |
| 46. | QQM18417 | T14I |
| 47. | QPI70342 | T120I |
| 48. | QPF70840 | F6S |
| 49. | QPF48049 | T14I |
| 50. | QPB69206 | T14I |
| 51. | QMX85090 | N43Y |
| 52. | QMX85114 | V104F |
| 53. | QKT21007 | P99L |
| 54. | QJY78109 | P99L |
| 55. | QJZ28119 | F109L |

Table 2. Mutational location after MSA of SARS-CoV-2 protein sequence with position and sequence from Asia

| Serial No. | Accession | Mutations |
|------------|-----------|-----------|
| 1. | QWM91976 | R25I |
| 2. | QWM91976 | V82A |
| 3. | QWN56114 | E16D |
| 4. | QWK65200 | T57A |
| 5. | QWK65246 | V82A |
| 6. | QWK65347 | V82A |
| 7. | QWK65347 | R25I |
| 8. | QWK65370 | V82A |
| 9. | QWK65370 | R25I |
| 10. | QWK39308 | V82A |
| 11. | QWK39308 | T120I |
| 12. | QWK39320 | V82A |
| 13. | QWK39332 | V82A |
| 14. | QWK39332 | L116F |
| 15. | QWK39332 | T120I |
| 16. | QWK39344 | V82A |
| 17. | QWK39344 | T120I |
| 18. | QWF08996 | K119N |

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| 19. | QWE51934 | V82A |
| 20. | QWE51946 | V82A |
| 21. | QWE51980 | V82A |
| 22. | QWE51992 | V82A |
| 23. | QWE52039 | Q76H |
| 24. | QWE52051 | Q76H |
| 25. | QWE52085 | V82A |
| 26. | QWE52097 | Q76H |
| 27. | QWE52097 | V82A |
| 28. | QWE52154 | V82A |
| 29. | QWE52188 | Q76H |
| 30. | QWE52188 | T120I |
| 31. | QWE52200 | Q76H |
| 32. | QWE52200 | T120I |
| 33. | QWE52234 | Q76H |
| 34. | QWE52246 | Q76H |
| 35. | QWE52269 | V82A |
| 36. | QWE52269 | T120I |
| 37. | QWE52281 | H73Y |
| 38. | QWE52281 | V82A |
| 39. | QWE52340 | R25I |
| 40. | QWE52340 | V82A |
| 41. | QWE52352 | Q76H |
| 42. | QWE52364 | R25I |
| 43. | QWE52364 | V82A |
| 44. | QWE77752 | V82A |
| 45. | QWE77752 | K119N |
| 46. | QWE77764 | V82A |
| 47. | QWE77835 | G38V |
| 48. | QWE78706 | V82A |
| 49. | QWE80869 | V82A |
| 50. | QWE80869 | K119N |
| 51. | QWC71513 | A105S |
| 52. | QWC92706 | V82A |
| 53. | QWC92740 | V82A |
| 54. | QWC36284 | V82A |
| 55. | QWC36296 | V82A |
| 56. | QWC36350 | V82A |
| 57. | QWC58584 | L17F |
| 58. | QWC58764 | S83L |
| 59. | QWB14555 | A8T |
| 60. | QWA32948 | V82A |
| 61. | QWA32948 | K119N |

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| 62. | QWA32960 | V82A |
| 63. | QWA32960 | K119N |
| 64. | QWA32996 | R25I |
| 65. | QWA32996 | V82A |
| 66. | QWA33020 | V82A |
| 67. | QWA33032 | V82A |
| 68. | QWA53296 | T120I |
| 69. | QWA53308 | T120I |
| 70. | BCX24663 | P45L |
| 71. | BCX24807 | G38R |
| 72. | BCX25954 | T39I |
| 73. | BCX26518 | P84L |
| 74. | BCX26950 | T39I |
| 75. | BCX27370 | S60I |
| 76. | BCX27610 | T28I |
| 77. | BCX28483 | A55V |
| 78. | BCX28506 | E16G |
| 79. | BCX29177 | Q94H |
| 80. | BCX29374 | V82A |
| 81. | BCX29374 | L116F |
| 82. | BCX29374 | T120I |
| 83. | BCX29386 | V82A |
| 84. | QVY49479 | T61I |
| 85. | QVY49491 | P99S |
| 86. | QVY49614 | V82A |
| 87. | QVY49614 | K119N |
| 88. | QVY49628 | V82A |
| 89. | QVY49640 | V82A |
| 90. | QVY49640 | K119N |
| 91. | QVY49652 | V82A |
| 92. | QVY49652 | K119N |
| 93. | QVY49664 | V82A |
| 94. | QVY49676 | V82A |
| 95. | QVT92549 | V82A |
| 96. | QVQ62974 | S37F |
| 97. | QVQ64378 | L5F |
| 98. | QVQ64534 | S37F |
| 99. | QVQ64546 | S37F |
| 100. | QVQ64750 | S37F |
| 101. | QVQ64962 | V93F |
| 102. | QVQ64974 | V93F |
| 103. | QVQ64988 | V93F |
| 104. | QVQ65012 | V93F |

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| 105. | QVO43976 | Q76H |
| 106. | QVO43988 | H73Y |
| 107. | QVP26045 | Q76H |
| 108. | QVP26493 | H73Y |
| 109. | QVL01156 | T28I |
| 110. | QVL01193 | T28I |
| 111. | QTY34252 | T28I |
| 112. | QTY34276 | R89I |
| 113. | QTY34441 | H47Y |
| 114. | QTY34453 | A105V |
| 115. | QVI56567 | S36P |
| 116. | QVI56663 | F63Y |
| 117. | QVI56698 | S81P |
| 118. | QUW45020 | G38R |
| 119. | QUW45020 | Q62S |
| 120. | QUW45176 | T14I |
| 121. | QUW05343 | A50V |
| 122. | QUF59088 | V82A |
| 123. | QUE44584 | R80I |
| 124. | QUE44608 | E16D |
| 125. | QUE44632 | L96F |
| 126. | QTY73066 | V82A |
| 127. | QTY73232 | T14I |
| 128. | QTY73347 | S83L |
| 129. | QTX93716 | H73Y |
| 130. | QTK04791 | V104I |
| 131. | QTK04851 | V104L |
| 132. | QTK04863 | V104I |
| 133. | QTH36422 | I100V |
| 134. | QTC10103 | L116F |
| 135. | QSN65241 | R118I |
| 136. | QQH16355 | Q62H |
| 137. | QQH16439 | Q62H |
| 138. | QSF12589 | F109S |
| 139. | QSF12841 | E91D |
| 140. | QRQ47078 | L96F |
| 141. | QRQ47090 | L96F |
| 142. | QLR06949 | T28I |
| 143. | QLR07105 | V104F |
| 144. | QLR07117 | V104F |
| 145. | QMW50833 | T28I |
| 146. | QNC49405 | T120I |
| 147. | QQS80903 | T120I |

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| 148. | QPP19257 | H47Y |
| 149. | QPN02408 | V93F |
| 150. | QPN02564 | R118I |
| 151. | QPN02576 | R118I |
| 152. | QPN06353 | R118I |
| 153. | QPM28125 | R118I |
| 154. | QPM28257 | R118I |
| 155. | QPM28317 | T14I |
| 156. | QPM28317 | L96F |
| 157. | QPM28329 | A13T |
| 158. | QPL23932 | R118I |
| 159. | QPL24040 | T11I |
| 160. | BCN28306 | V71I |
| 161. | QPB40060 | V108L |
| 162. | QPB40570 | L116F |
| 163. | QPB40582 | L116F |
| 164. | QPB17949 | H47Y |
| 165. | QPB17961 | H47Y |
| 166. | QPB17973 | H47Y |
| 167. | QPB39999 | P99L |
| 168. | QPA20215 | S36P |
| 169. | QOY98744 | E33K |
| 170. | QOZ00017 | I107L |
| 171. | QOZ00041 | T28I |
| 172. | QOS50002 | L12I |
| 173. | BCM16107 | I103V |
| 174. | BCM16119 | I103V |
| 175. | BCM16131 | I103V |
| 176. | BCM16143 | I103V |
| 177. | BCM16155 | I103V |
| 178. | BCM16179 | I103V |
| 179. | BCM16191 | I103V |
| 180. | BCM16203 | I103V |
| 181. | BCM16215 | I103V |
| 182. | BCM16227 | I103V |
| 183. | QNR60421 | F65Y |
| 184. | QNL98462 | V104F |
| 185. | QNL98474 | V104F |
| 186. | QNL35871 | T120I |
| 187. | QNJ45535 | R80T |
| 188. | QNB17764 | Q94H |
| 189. | QMU94793 | S37F |
| 190. | QMT97821 | A13T |

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| 191. | QMT97833 | A13T |
| 192. | QLR07201 | V71I |
| 193. | QLK98455 | V104F |
| 194. | QLK98494 | V104F |
| 195. | QLK98519 | V104F |
| 196. | QLL22778 | V104F |
| 197. | QLL25609 | V104F |
| 198. | QLL25830 | V104F |
| 199. | QLL25842 | V104F |
| 200. | QLL25926 | V104F |
| 201. | QLL25962 | V104F |
| 202. | QLL25974 | V104F |
| 203. | QLK03412 | V104F |
| 204. | QLK03436 | V104F |
| 205. | QLK03460 | V104F |
| 206. | QLK03472 | V104F |
| 207. | QLH90095 | Q94E |
| 208. | QLH56163 | P45L |
| 209. | QLH56199 | P45L |
| 210. | QLH56283 | Q62E |
| 211. | QLF97752 | A105V |
| 212. | QLF98282 | Q94E |
| 213. | QLE10770 | A105V |
| 214. | QLA46617 | C67Y |
| 215. | QKY65318 | G42V |
| 216. | QKQ30155 | E95K |
| 217. | QKQ63393 | E95K |
| 218. | QJX44615 | P45L |
| 219. | QJW69144 | L116F |
| 220. | QJR84386 | G38V |
| 221. | BCD58758 | S37F |

Table 3. Mutational location after MSA of SARS-CoV-2 protein sequence with position and sequence from Europe

| Serial No. | Accession | Mutations |
|------------|-----------|-----------|
| 1. | QWA53958 | V82A |
| 2. | QTT38037 | S37F |
| 3. | QTT01471 | P99S |
| 4. | QTT01565 | P99S |
| 5. | QTK16407 | T120I |
| 6. | QTC10735 | G42S |
| 7. | QSX24586 | V93F |
| 8. | QSF12408 | V93F |
| 9. | QSE38171 | P99S |
| 10. | QSE38467 | A79V |
| 11. | QSE38539 | A79V |
| 12. | QQQ16592 | R78L |
| 13. | QQP27505 | V104F |
| 14. | QQI07495 | V104F |
| 15. | QQD89111 | L77V |
| 16. | QPL24172 | T14I |
| 17. | QPF48325 | T14I |
| 18. | QPF48349 | T14I |
| 19. | QPF48637 | G38A |
| 20. | QPF48673 | C58F |
| 21. | QPF49081 | T115I |
| 22. | QOL21544 | E41D |
| 23. | QOL21628 | T14I |
| 24. | QOL21628 | T39I |

Table 4. Mutational location after MSA of SARS-CoV-2 protein sequence with position and sequence from Oceania

| Serial No. | Accession | Mutations |
|------------|-----------|-----------|
| 1. | QWC76152 | S81L |
| 2. | QWC76356 | S81L |
| 3. | QWC76452 | Q94H |
| 4. | QWC76716 | S81L |
| 5. | QWC80527 | V104F |
| 6. | QPK68409 | G38E |
| 7. | QPK70136 | G38E |
| 8. | QPK70460 | S98F |
| 9. | QPK70472 | P99S |

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| 10. | QPK74969 | G38E |
| 11. | QPK75256 | T28I |
| 12. | QPK75646 | E22D |
| 13. | QPF58171 | P99S |
| 14. | QPF60619 | E95Q |
| 15. | QPF61003 | V104F |
| 16. | QPF61243 | G38E |
| 17. | QPF64099 | V82I |
| 18. | QPF64447 | H47N |
| 19. | QPF64471 | L96F |
| 20. | QPF64963 | S36F |
| 21. | QPF67230 | G38E |
| 22. | QPF67506 | T39I |
| 23. | QOV09220 | V93F |
| 24. | QOT48502 | G38E |
| 25. | QOT50014 | P34L |
| 26. | QOT50278 | L96F |
| 27. | QOT50830 | L5F |
| 28. | QOT52966 | N52K |
| 29. | QOT53002 | G38E |
| 30. | QOT53158 | G38E |
| 31. | QOT53482 | G38E |
| 32. | QOT53578 | S37F |
| 33. | QOT54862 | G38E |
| 34. | QOT55990 | G38E |
| 35. | QOT57261 | A8V |
| 36. | QOT59025 | G38E |
| 37. | QOT61220 | S37F |
| 38. | QOT61807 | G38E |
| 39. | QOT62263 | G38A |
| 40. | QOT63883 | L102F |
| 41. | QOT68490 | S83L |
| 42. | QOT69533 | H73Y |
| 43. | QOT69713 | P84L |
| 44. | QOP79514 | Q94H |
| 45. | QOP81096 | P99S |
| 46. | QOP81120 | P99S |
| 47. | QOP82284 | T28I |
| 48. | QOP82644 | P34L |
| 49. | QOP83256 | G38E |
| 50. | QOP84035 | P99S |
| 51. | QOP84047 | G38E |
| 52. | QOP84958 | E121K |

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| 53. | QOP86649 | G38E |
| 54. | QOP87033 | L7V |
| 55. | QOP91820 | C15Y |
| 56. | QOP94603 | R78C |
| 57. | QOP95527 | P99S |
| 58. | QOQ03551 | G38E |
| 59. | QOQ04283 | T120I |
| 60. | QOQ05122 | P84L |
| 61. | QOQ06634 | G38E |
| 62. | QOQ07522 | G38E |
| 63. | QOQ07534 | G38E |
| 64. | QOQ07546 | G38E |
| 65. | QOQ09465 | V82I |
| 66. | QOQ10065 | H73Y |
| 67. | QOQ13317 | P34L |
| 68. | QOQ13521 | L96F |
| 69. | QOQ15309 | E121K |
| 70. | QOQ15477 | G38E |
| 71. | QOQ17020 | L116F |
| 72. | QOQ17692 | P84L |
| 73. | QOQ18460 | L49P |
| 74. | QOQ19924 | P34S |
| 75. | QOQ20044 | A105V |
| 76. | QOQ21795 | K119N |
| 77. | QOQ22575 | P99S |
| 78. | QOQ25237 | G38E |
| 79. | QOQ25500 | T14I |
| 80. | QOQ25692 | P99S |
| 81. | QOQ27608 | G38E |
| 82. | QOQ27620 | G38E |
| 83. | QOQ27968 | P84L |
| 84. | QOQ29537 | V93L |
| 85. | QNO58696 | Q94H |
| 86. | QNO59080 | H19R |
| 87. | QNO59248 | T39I |
| 88. | QNO59320 | T39I |
| 89. | QNO59392 | T39I |
| 90. | QNO61324 | H73Y |
| 91. | QNO64828 | R78C |
| 92. | QNO64840 | R78C |
| 93. | QNO64900 | A105V |
| 94. | QNO66460 | F46V |
| 95. | QNO69016 | T11K |

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| 96. | QNO69448 | T28I |
| 97. | QNO70240 | A50S |
| 98. | QNO70252 | A50S |
| 99. | QNO73996 | R80I |
| 100. | QNO76396 | R80I |
| 101. | QNO76408 | R80I |
| 102. | QNO76552 | R80I |
| 103. | QNO77608 | T28I |
| 104. | QNO80368 | H47Y |
| 105. | QNO87544 | A50S |
| 106. | QNO88516 | S83L |
| 107. | QNO92404 | L96F |
| 108. | QNO92524 | T39I |
| 109. | QNO93328 | Q76H |
| 110. | QNO94612 | T39I |
| 111. | QNO95716 | T39I |
| 112. | QNO96076 | G38V |
| 113. | QNO96160 | G38V |
| 114. | QNO97288 | Q76H |
| 115. | QNP02976 | P34S |
| 116. | QNP03324 | P34S |
| 117. | QNP05940 | V24I |
| 118. | QNP07212 | S37F |
| 119. | QLG75826 | E95Q |
| 120. | QLG76138 | V104F |
| 121. | QLG76582 | V104F |
| 122. | QLG76654 | H19R |
| 123. | QKV37313 | S81L |
| 124. | QKV38249 | S81L |
| 125. | QJR85238 | S81L |
| 126. | QJR85358 | S81L |
| 127. | QJR85370 | S81L |
| 128. | QJR85430 | S81L |
| 129. | QJR85454 | S81L |
| 130. | QJR85646 | S81L |
| 131. | QJR85670 | S81L |
| 132. | QJR85706 | S81L |
| 133. | QJR85874 | S81L |
| 134. | QJR85910 | S81L |
| 135. | QJR85994 | S81L |
| 136. | QJR86006 | S81L |
| 137. | QJR86210 | S81L |
| 138. | QJR86258 | S81L |

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| 139. | QJR86306 | S81L |
| 140. | QJR86366 | S81L |
| 141. | QJR87446 | S81L |
| 142. | QJR88934 | S81L |
| 143. | QJR88946 | S81L |
| 144. | QJR90314 | V104F |
| 145. | QJR91430 | S81L |
| 146. | QJR92882 | V93F |
| 147. | QJR93062 | S81L |
| 148. | QJR93422 | S81L |

Table 5. Mutational location after MSA of SARS-CoV-2 protein sequence with position and sequence from South America

| Serial No. | Accession | Mutations |
|-------------------|------------------|------------------|
| 1. | QWB90255 | S37T |
| 2. | QTW99519 | Y40H |
| 3. | QRW44576 | A13V |
| 4. | QPV06173 | T39I |
| 5. | QPV06859 | T39I |
| 6. | QPV12647 | T39I |
| 7. | QPV15004 | T39I |
| 8. | QPV15076 | T39I |
| 9. | QPV15184 | T39I |
| 10. | QPV15544 | T39I |
| 11. | QPV15604 | G70C |
| 12. | QPV15664 | G70C |
| 13. | QPV41953 | Q21H |
| 14. | QPV42193 | Q21H |
| 15. | QNV49691 | A8V |
| 16. | QNV49775 | P99L |
| 17. | QNV50135 | E22D |
| 18. | QNV50219 | V29L |
| 19. | QNV50243 | V29L |
| 20. | QNV50255 | V29L |
| 21. | QNV50327 | V29L |
| 22. | QNV50363 | V29L |