| **Virus protein** | **Replacement** | **Number of sequences** | **Grantham distance2** | **Miyata distance3** | **Notes** |
| --- | --- | --- | --- | --- | --- |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ORF 8** |  | | [L84S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:84:S) | | 3,703 | | 144 | 3.04 |  | | |
| **ORF 8** |  | | [S24L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:24:L) | | 912 | | 144 | 3.04 |  | | |
| **ORF 8** |  | | [V62L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:62:L) | | 520 | | 32 | 0.91 |  | | |
| **ORF 8** |  | | [A65S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:65:S) | | 113 | | 99 | 0.51 |  | | |
| **ORF 8** |  | | [A51V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:51:V) | | 59 | | 64 | 1.85 |  | | |
| **ORF 8** |  | | [S67F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:67:F) | | 50 | | 155 | 3.45 |  | | |
| **ORF 8** |  | | [Q18\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:18:*) | | 31 | | - | - |  | | |
| **ORF 8** |  | | [T26I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:26:I) | | 28 | | 89 | 2.14 |  | | |
| **ORF 8** |  | | [E19D](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:19:D) | | 27 | | 45 | 0.90 |  | | |
| **ORF 8** |  | | [W45L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:W:45:L) | | 27 | | 61 | 1.73 |  | | |
| **ORF 8** |  | | [A65V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:65:V) | | 27 | | 64 | 1.85 |  | | |
| **ORF 8** |  | | [Q72H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:72:H) | | 26 | | 24 | 0.32 |  | | |
| **ORF 8** |  | | [P36S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:36:S) | | 24 | | 73 | 0.56 |  | | |
| **ORF 8** |  | | [G8\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:8:*) | | 23 | | - | - |  | | |
| **ORF 8** |  | | [P36L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:36:L) | | 23 | | 98 | 2.70 |  | | |
| **ORF 8** |  | | [Q27\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:27:*) | | 22 | | - | - |  | | |
| **ORF 8** |  | | [V32L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:32:L) | | 21 | | 32 | 0.91 |  | | |
| **ORF 8** |  | | [T11I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:11:I) | | 19 | | 89 | 2.14 |  | | |
| **ORF 8** |  | | [E110\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:110:*) | | 19 | | - | - |  | | |
| **ORF 8** |  | | [S69L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:69:L) | | 18 | | 144 | 3.04 |  | | |
| **ORF 8** |  | | [F120L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:120:L) | | 18 | | 22 | 0.63 |  | | |
| **ORF 8** |  | | [D75V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:75:V) | | 17 | | 152 | 3.40 |  | | |
| **ORF 8** |  | | [E92K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:92:K) | | 17 | | 57 | 1.14 |  | | |
| **ORF 8** |  | | [G8R](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:8:R) | | 14 | | 125 | 3.58 |  | | |
| **ORF 8** |  | | [F104L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:104:L) | | 14 | | 22 | 0.63 |  | | |
| **ORF 8** |  | | [I121L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:121:L) | | 13 | | 5 | 0.14 |  | | |
| **ORF 8** |  | | [I10S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:10:S) | | 12 | | 142 | 2.95 |  | | |
| **ORF 8** |  | | [V5L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:5:L) | | 10 | | 32 | 0.91 |  | | |
| **ORF 8** |  | | [P38S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:38:S) | | 10 | | 73 | 0.56 |  | | |
| **ORF 8** |  | | [I39V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:39:V) | | 10 | | 30 | 0.85 |  | | |
| **ORF 8** |  | | [W45C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:W:45:C) | | 10 | | 214 | 3.34 |  | | |
| **ORF 8** |  | | [E106\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:106:*) | | 10 | | - | - |  | | |
| **ORF 8** |  | | [L4I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:4:I) | | 9 | | 5 | 0.14 |  | | |
| **ORF 8** |  | | [I9T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:9:T) | | 9 | | 89 | 2.14 |  | | |
| **ORF 8** |  | | [A55V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:55:V) | | 9 | | 64 | 1.85 |  | | |
| **ORF 8** |  | | [T87I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:87:I) | | 9 | | 89 | 2.14 |  | | |
| **ORF 8** |  | | [S54L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:54:L) | | 8 | | 144 | 3.04 |  | | |
| **ORF 8** |  | | [Y73H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:73:H) | | 8 | | 83 | 2.27 |  | | |
| **ORF 8** |  | | [L95F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:95:F) | | 8 | | 22 | 0.63 |  | | |
| **ORF 8** |  | | [F120V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:120:V) | | 8 | | 50 | 1.43 |  | | |
| **ORF 8** |  | | [T11A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:11:A) | | 7 | | 58 | 0.90 |  | | |
| **ORF 8** |  | | [D35Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:35:Y) | | 7 | | 160 | 3.95 |  | | |
| **ORF 8** |  | | [C37F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:37:F) | | 7 | | 204 | 2.24 |  | | |
| **ORF 8** |  | | [V81A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:81:A) | | 7 | | 64 | 1.85 |  | | |
| **ORF 8** |  | | [T11K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:11:K) | | 6 | | 78 | 2.10 |  | | |
| **ORF 8** |  | | [E19\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:19:*) | | 6 | | - | - |  | | |
| **ORF 8** |  | | [P38V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:38:V) | | 6 | | 68 | 1.79 |  | | |
| **ORF 8** |  | | [E64\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:64:*) | | 6 | | - | - |  | | |
| **ORF 8** |  | | [S69P](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:69:P) | | 6 | | 73 | 0.56 |  | | |
| **ORF 8** |  | | [P70L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:70:L) | | 6 | | 98 | 2.70 |  | | |
| **ORF 8** |  | | [V99L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:99:L) | | 6 | | 32 | 0.91 |  | | |
| **ORF 8** |  | | [C102F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:102:F) | | 6 | | 204 | 2.24 |  | | |
| **ORF 8** |  | | [S103L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:103:L) | | 6 | | 144 | 3.04 |  | | |
| **ORF 8** |  | | [R115L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:115:L) | | 6 | | 102 | 2.62 |  | | |
| **ORF 8** |  | | [L4F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:4:F) | | 5 | | 22 | 0.63 |  | | |
| **ORF 8** |  | | [G8V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:8:V) | | 5 | | 109 | 2.76 |  | | |
| **ORF 8** |  | | [Y31\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:31:*) | | 5 | | - | - |  | | |
| **ORF 8** |  | | [D34E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:34:E) | | 5 | | 45 | 0.90 |  | | |
| **ORF 8** |  | | [A51S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:51:S) | | 5 | | 99 | 0.51 |  | | |
| **ORF 8** |  | | [R52T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:52:T) | | 5 | | 71 | 2.03 |  | | |
| **ORF 8** |  | | [D63G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:63:G) | | 5 | | 94 | 2.37 |  | | |
| **ORF 8** |  | | [G96S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:96:S) | | 5 | | 55 | 0.85 |  | | |
| **ORF 8** |  | | [E110G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:110:G) | | 5 | | 98 | 2.78 |  | | |
| **ORF 8** |  | | [V114I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:114:I) | | 5 | | 30 | 0.85 |  | | |
| **ORF 8** |  | | [I121F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:121:F) | | 5 | | 21 | 0.61 |  | | |
| **ORF 8** |  | | [Y31H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:31:H) | | 4 | | 83 | 2.27 |  | | |
| **ORF 8** |  | | [G50\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:50:*) | | 4 | | - | - |  | | |
| **ORF 8** |  | | [P56S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:56:S) | | 4 | | 73 | 0.56 |  | | |
| **ORF 8** |  | | [E64D](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:64:D) | | 4 | | 45 | 0.90 |  | | |
| **ORF 8** |  | | [I71T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:71:T) | | 4 | | 89 | 2.14 |  | | |
| **ORF 8** |  | | [R115C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:115:C) | | 4 | | 180 | 3.06 |  | | |
| **ORF 8** |  | | [D119E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:119:E) | | 4 | | 45 | 0.90 |  | | |
| **ORF 8** |  | | [M1I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:M:1:I) | | 3 | | 10 | 0.29 |  | | |
| **ORF 8** |  | | [V5F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:5:F) | | 3 | | 50 | 1.43 |  | | |
| **ORF 8** |  | | [G8E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:8:E) | | 3 | | 98 | 2.78 |  | | |
| **ORF 8** |  | | [I10F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:10:F) | | 3 | | 21 | 0.61 |  | | |
| **ORF 8** |  | | [I10T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:10:T) | | 3 | | 89 | 2.14 |  | | |
| **ORF 8** |  | | [C20F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:20:F) | | 3 | | 204 | 2.24 |  | | |
| **ORF 8** |  | | [Q23\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:23:*) | | 3 | | - | - |  | | |
| **ORF 8** |  | | [Q23H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:23:H) | | 3 | | 24 | 0.32 |  | | |
| **ORF 8** |  | | [C25F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:25:F) | | 3 | | 204 | 2.24 |  | | |
| **ORF 8** |  | | [H28L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:28:L) | | 3 | | 99 | 2.59 |  | | |
| **ORF 8** |  | | [P30S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:30:S) | | 3 | | 73 | 0.56 |  | | |
| **ORF 8** |  | | [R52I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:52:I) | | 3 | | 98 | 2.49 |  | | |
| **ORF 8** |  | | [P56L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:56:L) | | 3 | | 98 | 2.70 |  | | |
| **ORF 8** |  | | [E59\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:59:*) | | 3 | | - | - |  | | |
| **ORF 8** |  | | [V62A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:62:A) | | 3 | | 64 | 1.85 |  | | |
| **ORF 8** |  | | [G66C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:66:C) | | 3 | | 158 | 2.22 |  | | |
| **ORF 8** |  | | [G66S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:66:S) | | 3 | | 55 | 0.85 |  | | |
| **ORF 8** |  | | [G77C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:77:C) | | 3 | | 158 | 2.22 |  | | |
| **ORF 8** |  | | [P85S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:85:S) | | 3 | | 73 | 0.56 |  | | |
| **ORF 8** |  | | [Q91K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:91:K) | | 3 | | 53 | 1.06 |  | | |
| **ORF 8** |  | | [R101C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:101:C) | | 3 | | 180 | 3.06 |  | | |
| **ORF 8** |  | | [E106Q](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:106:Q) | | 3 | | 29 | 0.84 |  | | |
| **ORF 8** |  | | [E110Q](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:110:Q) | | 3 | | 29 | 0.84 |  | | |
| **ORF 8** |  | | [V117F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:117:F) | | 3 | | 50 | 1.43 |  | | |
| **ORF 8** | |  | | [L7\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:7:*) | | 2 | | | - | - |
| **ORF 8** | |  | | [A14S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:14:S) | | 2 | | | 99 | 0.51 |
| **ORF 8** | |  | | [H17Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:17:Y) | | 2 | | | 83 | 2.27 |
| **ORF 8** | |  | | [H28Q](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:28:Q) | | 2 | | | 24 | 0.32 |
| **ORF 8** | |  | | [P30L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:30:L) | | 2 | | | 98 | 2.70 |
| **ORF 8** | |  | | [V32I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:32:I) | | 2 | | | 30 | 0.85 |
| **ORF 8** | |  | | [P38L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:38:L) | | 2 | | | 98 | 2.70 |
| **ORF 8** | |  | | [W45\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:W:45:*) | | 2 | | | - | - |
| **ORF 8** | |  | | [R48G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:48:G) | | 2 | | | 125 | 3.58 |
| **ORF 8** | |  | | [V49L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:49:L) | | 2 | | | 32 | 0.91 |
| **ORF 8** | |  | | [G50E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:50:E) | | 2 | | | 98 | 2.78 |
| **ORF 8** | |  | | [A51D](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:51:D) | | 2 | | | 126 | 2.37 |
| **ORF 8** | |  | | [K53N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:K:53:N) | | 2 | | | 94 | 1.84 |
| **ORF 8** | |  | | [I58L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:58:L) | | 2 | | | 5 | 0.14 |
| **ORF 8** | |  | | [L60F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:60:F) | | 2 | | | 22 | 0.63 |
| **ORF 8** | |  | | [A65G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:65:G) | | 2 | | | 60 | 0.91 |
| **ORF 8** | |  | | [A65T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:65:T) | | 2 | | | 58 | 0.90 |
| **ORF 8** | |  | | [I71F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:71:F) | | 2 | | | 21 | 0.61 |
| **ORF 8** | |  | | [D75G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:75:G) | | 2 | | | 94 | 2.37 |
| **ORF 8** | |  | | [D75N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:75:N) | | 2 | | | 23 | 0.65 |
| **ORF 8** | |  | | [D75Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:75:Y) | | 2 | | | 160 | 3.95 |
| **ORF 8** | |  | | [I76V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:76:V) | | 2 | | | 30 | 0.85 |
| **ORF 8** | |  | | [G77S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:77:S) | | 2 | | | 55 | 0.85 |
| **ORF 8** | |  | | [I88V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:88:V) | | 2 | | | 30 | 0.85 |
| **ORF 8** | |  | | [P93L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:93:L) | | 2 | | | 98 | 2.70 |
| **ORF 8** | |  | | [G96C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:96:C) | | 2 | | | 158 | 2.22 |
| **ORF 8** | |  | | [R101L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:101:L) | | 2 | | | 102 | 2.62 |
| **ORF 8** | |  | | [F104S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:104:S) | | 2 | | | 155 | 3.45 |
| **ORF 8** | |  | | [D107E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:107:E) | | 2 | | | 45 | 0.90 |
| **ORF 8** | |  | | [D107Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:107:Y) | | 2 | | | 160 | 3.95 |
| **ORF 8** | |  | | [H112Q](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:112:Q) | | 2 | | | 24 | 0.32 |
| **ORF 8** | |  | | [D113Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:113:Y) | | 2 | | | 160 | 3.95 |
| **ORF 8** | |  | | [V114F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:114:F) | | 2 | | | 50 | 1.43 |
| **ORF 8** | |  | | [M1T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:M:1:T) | | 1 | | | 81 | 1.86 |
| **ORF 8** | |  | | [M1V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:M:1:V) | | 1 | | | 22 | 0.62 |
| **ORF 8** | |  | | [K2E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:K:2:E) | | 1 | | | 57 | 1.14 |
| **ORF 8** | |  | | [F3I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:3:I) | | 1 | | | 21 | 0.61 |
| **ORF 8** | |  | | [F3L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:3:L) | | 1 | | | 22 | 0.63 |
| **ORF 8** | |  | | [V5A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:5:A) | | 1 | | | 64 | 1.85 |
| **ORF 8** | |  | | [L7S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:7:S) | | 1 | | | 144 | 3.04 |
| **ORF 8** | |  | | [I9M](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:9:M) | | 1 | | | 10 | 0.29 |
| **ORF 8** | |  | | [T12A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:12:A) | | 1 | | | 58 | 0.90 |
| **ORF 8** | |  | | [T12I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:12:I) | | 1 | | | 89 | 2.14 |
| **ORF 8** | |  | | [T12S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:12:S) | | 1 | | | 58 | 0.89 |
| **ORF 8** | |  | | [V13I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:13:I) | | 1 | | | 30 | 0.85 |
| **ORF 8** | |  | | [A15V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:15:V) | | 1 | | | 64 | 1.85 |
| **ORF 8** | |  | | [F16S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:16:S) | | 1 | | | 155 | 3.45 |
| **ORF 8** | |  | | [F16V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:16:V) | | 1 | | | 50 | 1.43 |
| **ORF 8** | |  | | [Q18K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:18:K) | | 1 | | | 53 | 1.06 |
| **ORF 8** | |  | | [E19K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:19:K) | | 1 | | | 57 | 1.14 |
| **ORF 8** | |  | | [C20G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:20:G) | | 1 | | | 158 | 2.22 |
| **ORF 8** | |  | | [C25S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:25:S) | | 1 | | | 112 | 1.84 |
| **ORF 8** | |  | | [T26A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:26:A) | | 1 | | | 58 | 0.90 |
| **ORF 8** | |  | | [H28Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:28:Y) | | 1 | | | 83 | 2.27 |
| **ORF 8** | |  | | [Q29\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:29:*) | | 1 | | | - | - |
| **ORF 8** | |  | | [Q29R](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:29:R) | | 1 | | | 43 | 1.13 |
| **ORF 8** | |  | | [P30Q](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:30:Q) | | 1 | | | 75 | 1.92 |
| **ORF 8** | |  | | [P30T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:30:T) | | 1 | | | 38 | 0.87 |
| **ORF 8** | |  | | [V32G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:32:G) | | 1 | | | 109 | 2.76 |
| **ORF 8** | |  | | [V33A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:33:A) | | 1 | | | 64 | 1.85 |
| **ORF 8** | |  | | [V33I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:33:I) | | 1 | | | 30 | 0.85 |
| **ORF 8** | |  | | [D34G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:34:G) | | 1 | | | 94 | 2.37 |
| **ORF 8** | |  | | [D34V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:34:V) | | 1 | | | 152 | 3.40 |
| **ORF 8** | |  | | [D35E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:35:E) | | 1 | | | 45 | 0.90 |
| **ORF 8** | |  | | [D35N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:35:N) | | 1 | | | 23 | 0.65 |
| **ORF 8** | |  | | [H40P](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:40:P) | | 1 | | | 76 | 2.15 |
| **ORF 8** | |  | | [H40Q](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:40:Q) | | 1 | | | 24 | 0.32 |
| **ORF 8** | |  | | [H40Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:40:Y) | | 1 | | | 83 | 2.27 |
| **ORF 8** | |  | | [F41Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:41:Y) | | 1 | | | 22 | 0.48 |
| **ORF 8** | |  | | [Y42H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:42:H) | | 1 | | | 83 | 2.27 |
| **ORF 8** | |  | | [S43F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:43:F) | | 1 | | | 155 | 3.45 |
| **ORF 8** | |  | | [S43P](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:43:P) | | 1 | | | 73 | 0.56 |
| **ORF 8** | |  | | [W45S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:W:45:S) | | 1 | | | 177 | 4.38 |
| **ORF 8** | |  | | [Y46\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:46:*) | | 1 | | | - | - |
| **ORF 8** | |  | | [I47V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:47:V) | | 1 | | | 30 | 0.85 |
| **ORF 8** | |  | | [A51G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:51:G) | | 1 | | | 60 | 0.91 |
| **ORF 8** | |  | | [R52K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:52:K) | | 1 | | | 26 | 0.40 |
| **ORF 8** | |  | | [R52S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:52:S) | | 1 | | | 109 | 2.74 |
| **ORF 8** | |  | | [S54P](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:54:P) | | 1 | | | 73 | 0.56 |
| **ORF 8** | |  | | [S54T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:54:T) | | 1 | | | 58 | 0.89 |
| **ORF 8** | |  | | [P56H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:56:H) | | 1 | | | 76 | 2.15 |
| **ORF 8** | |  | | [L57S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:57:S) | | 1 | | | 144 | 3.04 |
| **ORF 8** | |  | | [I58N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:58:N) | | 1 | | | 149 | 3.37 |
| **ORF 8** | |  | | [I58T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:58:T) | | 1 | | | 89 | 2.14 |
| **ORF 8** | |  | | [D63A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:63:A) | | 1 | | | 126 | 2.37 |
| **ORF 8** | |  | | [D63N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:63:N) | | 1 | | | 23 | 0.65 |
| **ORF 8** | |  | | [E64V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:64:V) | | 1 | | | 121 | 2.97 |
| **ORF 8** | |  | | [A65D](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:A:65:D) | | 1 | | | 126 | 2.37 |
| **ORF 8** | |  | | [G66A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:66:A) | | 1 | | | 60 | 0.91 |
| **ORF 8** | |  | | [G66V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:66:V) | | 1 | | | 109 | 2.76 |
| **ORF 8** | |  | | [K68\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:K:68:*) | | 1 | | | - | - |
| **ORF 8** | |  | | [K68E](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:K:68:E) | | 1 | | | 57 | 1.14 |
| **ORF 8** | |  | | [P70S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:70:S) | | 1 | | | 73 | 0.56 |
| **ORF 8** | |  | | [P70T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:70:T) | | 1 | | | 38 | 0.87 |
| **ORF 8** | |  | | [Q72R](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:72:R) | | 1 | | | 43 | 1.13 |
| **ORF 8** | |  | | [I74F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:74:F) | | 1 | | | 21 | 0.61 |
| **ORF 8** | |  | | [I74L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:74:L) | | 1 | | | 5 | 0.14 |
| **ORF 8** | |  | | [I74T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:74:T) | | 1 | | | 89 | 2.14 |
| **ORF 8** | |  | | [I74V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:74:V) | | 1 | | | 30 | 0.85 |
| **ORF 8** | |  | | [I76F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:76:F) | | 1 | | | 21 | 0.61 |
| **ORF 8** | |  | | [I76T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:76:T) | | 1 | | | 89 | 2.14 |
| **ORF 8** | |  | | [T80I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:80:I) | | 1 | | | 89 | 2.14 |
| **ORF 8** | |  | | [T80K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:T:80:K) | | 1 | | | 78 | 2.10 |
| **ORF 8** | |  | | [S82P](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:82:P) | | 1 | | | 73 | 0.56 |
| **ORF 8** | |  | | [C83F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:83:F) | | 1 | | | 204 | 2.24 |
| **ORF 8** | |  | | [C83Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:83:Y) | | 1 | | | 194 | 2.38 |
| **ORF 8** | |  | | [L84F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:84:F) | | 1 | | | 22 | 0.63 |
| **ORF 8** | |  | | [P85L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:85:L) | | 1 | | | 98 | 2.70 |
| **ORF 8** | |  | | [P85T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:85:T) | | 1 | | | 38 | 0.87 |
| **ORF 8** | |  | | [F86S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:86:S) | | 1 | | | 155 | 3.45 |
| **ORF 8** | |  | | [I88F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:88:F) | | 1 | | | 21 | 0.61 |
| **ORF 8** | |  | | [I88T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:88:T) | | 1 | | | 89 | 2.14 |
| **ORF 8** | |  | | [N89D](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:N:89:D) | | 1 | | | 23 | 0.65 |
| **ORF 8** | |  | | [N89S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:N:89:S) | | 1 | | | 46 | 1.31 |
| **ORF 8** | |  | | [C90F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:90:F) | | 1 | | | 204 | 2.24 |
| **ORF 8** | |  | | [Q91H](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Q:91:H) | | 1 | | | 24 | 0.32 |
| **ORF 8** | |  | | [E92G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:92:G) | | 1 | | | 98 | 2.78 |
| **ORF 8** | |  | | [P93S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:P:93:S) | | 1 | | | 73 | 0.56 |
| **ORF 8** | |  | | [K94I](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:K:94:I) | | 1 | | | 102 | 2.84 |
| **ORF 8** | |  | | [K94T](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:K:94:T) | | 1 | | | 78 | 2.10 |
| **ORF 8** | |  | | [G96V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:G:96:V) | | 1 | | | 109 | 2.76 |
| **ORF 8** | |  | | [S97N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:97:N) | | 1 | | | 46 | 1.31 |
| **ORF 8** | |  | | [V100L](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:100:L) | | 1 | | | 32 | 0.91 |
| **ORF 8** | |  | | [C102Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:C:102:Y) | | 1 | | | 194 | 2.38 |
| **ORF 8** | |  | | [S103P](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:S:103:P) | | 1 | | | 73 | 0.56 |
| **ORF 8** | |  | | [Y105N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:105:N) | | 1 | | | 142 | 3.42 |
| **ORF 8** | |  | | [E106G](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:106:G) | | 1 | | | 98 | 2.78 |
| **ORF 8** | |  | | [E106K](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:106:K) | | 1 | | | 57 | 1.14 |
| **ORF 8** | |  | | [E106V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:106:V) | | 1 | | | 121 | 2.97 |
| **ORF 8** | |  | | [D107N](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:107:N) | | 1 | | | 23 | 0.65 |
| **ORF 8** | |  | | [F108S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:108:S) | | 1 | | | 155 | 3.45 |
| **ORF 8** | |  | | [F108V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:108:V) | | 1 | | | 50 | 1.43 |
| **ORF 8** | |  | | [F108Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:F:108:Y) | | 1 | | | 22 | 0.48 |
| **ORF 8** | |  | | [E110D](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:E:110:D) | | 1 | | | 45 | 0.90 |
| **ORF 8** | |  | | [Y111C](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:Y:111:C) | | 1 | | | 194 | 2.38 |
| **ORF 8** | |  | | [H112R](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:112:R) | | 1 | | | 29 | 0.82 |
| **ORF 8** | |  | | [H112Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:H:112:Y) | | 1 | | | 83 | 2.27 |
| **ORF 8** | |  | | [R115S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:R:115:S) | | 1 | | | 109 | 2.74 |
| **ORF 8** | |  | | [V116A](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:V:116:A) | | 1 | | | 64 | 1.85 |
| **ORF 8** | |  | | [L118\*](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:118:*) | | 1 | | | - | - |
| **ORF 8** | |  | | [L118F](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:118:F) | | 1 | | | 22 | 0.63 |
| **ORF 8** | |  | | [L118S](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:118:S) | | 1 | | | 144 | 3.04 |
| **ORF 8** | |  | | [L118V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:L:118:V) | | 1 | | | 32 | 0.91 |
| **ORF 8** | |  | | [D119Y](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:D:119:Y) | | 1 | | | 160 | 3.95 |
| **ORF 8** | |  | | [I121V](http://cov-glue.cvr.gla.ac.uk/#project/replacement/ORF_8:I:121:V) | | 1 | | | 30 | 0.85 |

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| **ORF 8** |  | [28090-28095](http://cov-glue.cvr.gla.ac.uk/#project/deletion/ORF_8:nca:28090:28095) | | No | | N/A | | 16 |
| **ORF 8** |  | [27910-28254](http://cov-glue.cvr.gla.ac.uk/#project/deletion/ORF_8:nca:27910:28254) | No | N/A | 2 | |  | |

Singer, J.; Gifford, R.; Cotten, M.; Robertson, D. CoV-GLUE: A Web Application for Tracking SARS-CoV-2 Genomic Variation. Preprints 2020, 2020060225 (doi: 10.20944/preprints202006.0225.v1).