Supplementary Information for the article

Trends of mutation accumulation across global SARS-CoV-2 genomes: Implications for the ecology and evolution of the novel coronavirus

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Table S2. Localization of all the 655 transversion mutations detected in the SARS-CoV-2 pan genome.

Supplementary Figure

Figure S1. Probable chemical reactions causing the transition mutation C→U.

References used in the the legend of Figure S1

Table S1. Localization of all the 1797 transition mutations detected in the SARS-CoV-2 pan genome.

Genomic locus (nucleotide positions[1] between which the locus spans)	Nucleotide position[1] of the **A→G** mutation detected	Nucleotide position[1] of the **G→A** mutation detected	Nucleotide position[1] of the **C→U** mutation detected	Nucleotide position[1] of the **U→C** mutation detected
5/ UTR (1-265)	97 187 231	23 101 160 198	19 21 28 36 40 64 66 100 106 110 140 147 180 183 218 222 228 241 254	13 141 181 221
nsp1 (266-806)	270 301 361 460 570 618 761	271 319 354 362 374 388 491 578 598 613 614 626 680 740	292 313 337 364 506 527 541 583 601 619 643 673 679 703 784 799	327 334 400 514 565 606 658 721 771 778
nsp2 (807-2720)	895 1015 1098 1262 1317 1399 1430 1515 1547 1622 1646 1691 1815 1817 2018 2104 2160 2165 2480 2550 2590	840 922 932 957 960 1001 1145 1148 1319 1401 1440 1467 1478 1548 1595 1598 1658 1681 1685 1697 1719	823 829 832 835 875 884 900 936 958 1059 1063 1076 1102 1150 1191 1218 1221 1225 1238 1267 1288	833 1066 1117 1368 1372 1570 1592 1623 1918 2149 2244 2266 2277 2446 2551 2561

	2651 2705	1736 1820 1868 2229 2243 2249 2447 2448 2527 2528 2534 2717	1329 1348 1380 1385 1387 1392 1404 1419 1420 1427 1437 1457 1469 1473 1514 1519 1545 1594 1616 1625 1734 1762 1812 1878 1887 1912 1913 1917 1929 2003 2061 2062 2091 2094 2106 2110 2113 2156 2221 2232 2388 2397 2416 2434 2445 2453 2455 2469 2485 2507 2508 2523 2536 2558 2574 2644 2652 2676 2716	
nsp3 (2720-8555)	2863 3010 3046 3094 3138	2808 2840 2875 2891 2945	2836 2862 2910 2937 2939	2851 2884 2992 3011 3144

	3234	3014	2942	3229
	3372	3242	2980	3299
	3503	3248	3037	3312
	3517	3259	3040	3380
	3558	3307	3096	3607
	3635	3410	3099	3628
	3778	3419	3130	3766
	3889	3955	3140	3931
	4015	4255	3168	4322
	4220	4523	3176	4402
	4236	4642	3241	4597
	4269	4678	3253	4615
	4282	4951	3293	4779
	4297	5062	3317	4885
	4386	5273	3365	4946
	4892	5572	3369	4949
	4967	5665	3411	5098
	4987	6032	3426	5165
	5084	6134	3505	5218
	5337	6209	3552	5338
	5462	6220	3587	5449
	5714	6352	3589	5698
	5725	6362	3593	5728
	5838	6369	3634	5851
	5995	6419	3653	5860
	6035	6443	3688	5862
	6081	6446	3737	6069
	6183	6653	3738	6079
	6228	7016	3768	6119
	6277	7128	3784	6345
	6313	7273	3811	6394
	6324	7283	3817	6427
	6331	7560	3832	6691
	6350	7561	3874	6702
	6466	8171	3876	6746
	6616	8185	3923	6814
	6639	8368	3992	6844
	6646	8525	4002	6853
	6672		4069	6989
	6693		4084	6996
	6748		4113	7022
	6818		4158	7084
	6821		4202	7225
	6944		4234	7438
	7079		4320	7513
	7130		4400	7582
	7291		4423	7767
	7479		4456	8004
	7770		4475	8068
	7901		4540	8296
	8031		4543	8431
	8072		4551	
	8073		4575	
	8115		4577	
	8170		4582	
	8388		4668	
			4683	
			4755	
			4780	
			4795	
			4809	
			4810	
			4878	
			4891	

			4897 4900 4940 4990 5000 5005 5007 5052 5140 5170 5183 5184 5211 5239 5281 5284 5298 5339 5348 5385 5467 5497 5512 5544 5547 5622 5717 5730 5784 5806 5812 5826 5849 5869 5884 5886 5934 5974 5986 6026 6027 6031 6040 6070 6145 6190 6195 6255 6258 6267 6285 6286 6310 6354 6361 6363 6384 6402 6445 6500 6501 6504 6541 6548	

			6555 6568 6573 6578 6606 6627 6636 6638 6695 6696 6701 6723 6730 6762 6843 6936 6982 7011 7029 7081 7083 7093 7119 7164 7165 7267 7321 7334 7420 7518 7528 7564 7600 7609 7716 7732 7749 7765 7815 7843 7926 7945 8025 8067 8078 8090 8092 8140 8146 8175 8228 8240 8266 8357 8367 8389	
nsp4 (8556-10055)	8681 8728 8882 8945 8972 9034 9048 9236	8602 8768 8785 8851 8852 8867 8876 9092	8626 8660 8683 8697 8722 8782 8841 8917	8707 8719 8855 8886 9037 9046 9070 9157

	9244 9274 9307 9433 9514 9698 9707 9749 9793 9830 9838 9848	9116 9136 9176	8937 8950 8956 8980 9039 9113 9159 9166 9170 9180 9223 9246 9319 9360 9430 9438 9443 9474 9491 9521 9561 9565 9598 9724 9733 9803 9857 9866 9891 9924 9943 9951 9962 9967 9979 9996 10015 10029 10036	9172 9511 9660 9706 9708 9976
nsp5 (10056-10973)	10236 10248 10317 10323 10329 10434 10479 10579 10622 10761 10829 10948	10097 10265 10368 10617 10631	10138 10156 10188 10202 10207 10232 10277 10279 10296 10319 10335 10369 10377 10416 10440 10448 10456 10507 10525 10572 10582 10623 10626 10632 10712	10129 10216 10480 10524 10561 10756 10771 10933 10960

			10755 10776 10818 10851 10889 10965	
nsp6 (10974-11843)	11101 11217 11268 11425 11537 11585 11595 11782 11830	11161 11291 11306 11327 11375 11410 11534 11557 11807	10989 11003 11008 11020 11036 11074 11109 11195 11200 11224 11289 11379 11455 11620 11653 11674 11704 11747 11750 11752 11758 11824 11832 11835	11107 11121 11182 11264 11320 11526 11538 11635 11638 11798
nsp7 (11844-12092)	11957 12004 12077 12082	11937 12071	11916 11919 11941 11956 12025 12073	11879 11959 11974 12037 12045
nsp8 (12093-12686)	12103 12286 12507 12557 12631	12111 12149 12167 12274 12378 12600 12613	12100 12102 12115 12119 12132 12153 12213 12242 12357 12400 12403 12415 12439 12488 12513 12525 12534 12616 12651 12664	12112 12629
nsp9 (12687-13025)	12787 12820	12758 12795 12797 12806	12710 12729 12754 12778 12781 12789 12809 12854	12757 13006

			12880 12890 12915 12919 12933 12992 13005	
nsp10 (13026-13442)	13198 13318	NIL	13072 13083 13115 13138 13170 13225 13252 13297 13329 13384	13090 13180 13210 13438
nsp11 (13443-13481)	NIL	NIL	NIL	NIL
nsp12 (13482-16328)	13522 13712 13748 13755 13768 13859 13962 14224 14604 14673 14747 14774 14836 14856 14882 14912 15205 15477 15593 15972 16060 16095	13723 13975 14118 14126 14274 14712 15260 15414 15594 15760 16068 16078 16221 16240 16245	13487 13511 13515 13517 13536 13554 13608 13620 13665 13721 13730 13740 13862 13994 14177 14178 14183 14184 14235 14262 14267 14322 14340 14408 14422 14554 14599 14649 14657 14676 14697 14724 14786 14805 14877 14925 14932 14937 14980 15024 15101 15154 15216 15222	13572 13845 13914 13929 13932 14073 14104 14151 14259 14313 14438 14492 14501 14568 14679 15166 15264 15597 15607 15648 15849 15888 15922 16047 16077 16242 16299

			15240 15324 15371 15480 15540 15613 15615 15654 15720 15738 15752 15852 15857 15868 15895 15928 15960 15963 16017 16045 16073 16084 16111 16173 16178 16260 16289 16293 16308	
nsp13 (16329-18041)	16467 16474 16628 16841 16942 16947 17287 17289 17344 17376 17423 17482 17542 17615 17622 17631 17858 17884 17961 17993 18015	16381 17049 17058 17149 17158 17632 17964 17988	16329 16375 16386 16428 16457 16466 16468 16568 16575 16616 16658 16679 16694 16716 16726 16750 16830 16848 16859 16869 16877 16887 16915 17000 17004 17104 17118 17125 17135 17249 17274 17326 17372 17373 17397	16413 16419 16939 16950 17142 17154 17247 17380 17673 17688 17863 17877

			17402 17440 17470 17474 17518 17550 17569 17639 17649 17690 17747 17766 17802 17825 17850 17894 17898 17934 17985 18029	
nsp14 (18042-19622)	18057 18121 18134 18710 18802 18956 19137 19155 19166 19459	18379 18433 19509	18060 18115 18129 18131 18167 18176 18246 18252 18264 18377 18401 18431 18441 18452 18457 18486 18508 18555 18568 18647 18654 18680 18681 18744 18788 18795 18796 18814 18828 18877 18885 18888 18928 18929 18998 19011 19017 19018 19102 19118 19164 19170 19220 19263	18126 18345 18381 18384 18411 18471 18519 18603 18736 18834 18927 18996 19065 19203

			19269 19325 19366 19488 19524 19547 19554 19610	
nsp15 (19623-20660)	19722 19818 19883 20268 20553	19711 19800 19847 19962 20005 20131 20580	19718 19763 19813 19836 19854 19862 19881 19952 19961 20016 20030 20051 20081 20148 20178 20204 20233 20270 20316 20320 20402 20480 20483 20555 20611 20646	19700 19839 20063 20151 20253 20256 20281 20401 20466 20537
nsp16 (20661-21554)	20667 20898 21018 21137 21267 21511	20670 20752 20887 20890 21316	20677 20692 20703 20719 20762 20801 20823 20844 20930 20936 21005 21058 21077 21114 21139 21306 21364 21365 21386 21410 21513 21552	20769 20891 21126 21144 21147 21458 21467
geneS (21563-25384)	21562 21626 21906 22005 22036 22124 22151 22278	21796 21893 22201 22225 22344 22346 22604 22984	21575 21588 21595 21614 21627 21636 21642 21646	21616 21656 21790 21797 21838 21890 21931 21995

	22320 22374 22455 22525 22798 23083 23147 23235 23403 23440 23796 23947 23989 24014 24121 24123 24325 24367 24520 24862 24877 25050 25060 25104	22988 23426 23607 23876 24047 24075 24145 25252 25340	21648 21691 21707 21711 21721 21736 21742 21757 21767 21774 21781 21789 21805 21811 21846 21910 21911 21914 21998 22120 22281 22323 22326 22432 22444 22450 22480 22530 22624 22735 22858 23185 23206 23230 23244 23271 23277 23393 23423 23439 23453 23502 23520 23525 23551 23557 23575 23577 23589 23606 23635 23638 23673 23707 23731 23758 23785 23865 23929 23934 23996 24023 24034 24042	22078 22207 22318 22516 22741 22939 22965 23010 23018 23042 23284 23287 23427 23482 23599 23677 23822 24022 24152 24364 24628 24749 24832 24887 24929 24948 24979 24982 25036

			24099 24130 24138 24213 24237 24351 24370 24378 24382 24502 24503 24621 24700 24748 24784 24795 24797 24844 24863 24865 24904 24921 25047 25066 25096 25156 25169 25207 25214 25231 25318 25339 25344 25350	
orf3a (25393-26220)	25449 25492 25616 25744 25759 25847 25853 26019 26045 26055 26183	25835 25850 25978 26104 26152 26172	25452 25466 25469 25487 25513 25516 25521 25528 25549 25572 25584 25585 25587 25603 25609 25614 25624 25672 25692 25702 25708 25710 25714 25792 25803 25810 25844 25854 25904 25916	25473 25496 25518 25541 25655 25673 25682 25724 25750 25795 25956 26035 26038 26094 26102 26130

			25919 25936 26013 26022 26028 26032 26037 26060 26078 26088 26111 26124 26204	
geneE (26245-26472)	26433	26466	26256 26313 26326 26351 26456 26461 26464	26320
geneM (26523-27191)	26530 26864	26730 26787 26959 27074 27090	26527 26534 26559 26601 26606 26625 26645 26681 26684 26728 26735 26750 26768 26822 26892 26895 26907 26916 26936 26955 26985 26996 27005 27011 27046 27059 27092 27131 27167	26609 26729 26780 26861 27056
orf6 (27202-27387)	27200 27302 27359	NIL	27208 27213 27263 27276 27294 27297 27331	27272 27285 27299 27384
orf7a (27394-27759)	27397 27398 27421 27515 27525 27669	27604	27416 27434 27476 27498 27500 27527 27549 27559	27408 27546 27560 27722

			27577 27600 27603 27612 27625 27630 27635 27654 27657 27673 27684 27688 27710 27739 27741	
orf8 (27894-28259)	27821 27860 27924 28210 28222 28259	27916 28202 28212	27964 27998 27999 28005 28093 28099	27895 28061 28144 28151 28199
geneN (28274-29533)	28283 28338 28390 28811 28848 28858 28885 29012 29292 29403	28314 28321 28376 28396 28631 28798 28878 28881 28916 28931 29239 29260 29291 29374 29383 29422 29440 29473 29527	28311 28332 28391 28409 28432 28472 28519 28528 28603 28606 28629 28651 28657 28697 28708 28720 28826 28830 28836 28849 28854 28863 28866 28873 28887 28915 28948 28961 28977 29013 29077 29085 29095 29119 29144 29167 29177 29199 29218 29230 29250 29253 29272	28297 28360 28393 28450 28648 28688 28693 28723 28759 28835 28861 28924 28930 29026 29029 29148 29308 29410 29452

			29274 29284 29296 29303 29311 29353 29358 29366 29409 29415 29416 29420 29445 29451 29503 29520	
orf10 (29558-29674)	NIL	29573	29563 29614 29625 29627 29635 29640 29642 29668	NIL
3/ UTR 29675-29903)	29695 29700	29742 29747 29861 29868	29708 29724 29732 29733 29738 29739 29743 29750 29754 29762 29769 29774 29837 29838	29685 29710 29758 29793 29821

[1] All nucleotide positions are designated based on the 5' to 3' sequence of the 29,903 nucleotide RNA-genome (MN908947.3) of the reference strain from Wuhan, China.

Table S2. Localization of all the 655 transversion mutations detected in the SARS-CoV-2 pan genome.

Genomic locus (nucleotide positions[1] between which the locus spans)	Nucleotide position[1] of the **U→A** mutation detected	Nucleotide position[1] of the **U→G** mutation detected	Nucleotide position[1] of the **C→A** mutation detected	Nucleotide position[1] of the **C→G** mutation detected	Nucleotide position[1] of the **A→U** mutation detected	Nucleotide position[1] of the **A→C** mutation detected	Nucleotide position[1] of the **G→U** mutation detected	Nucleotide position[1] of the **G→C** mutation detected
5′ UTR (1-265)	77 104	153	37 75 84 186	NIL	34	55 74	105 199 204 210 219 252	NIL
nsp1 (266-806)	490	NIL	274 379	NIL	652	691 696	332 370 377 625	NIL
nsp2 (807-2720)	956 1978 2153	1211	2263 2592 2636 2701	NIL	652 1163 1632 2269	1079 2274	872 1274 1413 1890 1895 2144 2164 2203 2309 2518 2632	NIL
nsp3 (2720-8555)	2737 3331 4011 6779	3178 3843 5485 6905	3141 3177 3373 3698 4155 4230 5694 5700 6016 6312 7728 7844 8318	5240	3841 4544 5845	3428 3625 4307 4912 5011 6398 6424 6512 6729 8001	2764 2782 2951 2971 3145 3231 3246 3251 3286 3518 3759 3871 3892 3947 4148 4180 4201 4285 4288 4300 4390 4866 4904 4975 5194 5206 5230 5246 5461 5716 6337 6589 6819 6865 6894 6961 6975 7042 7393 7675 7790 7798 7866 7936 8102 8131 8137 8371	3113 3831 4510
nsp4 (8556-10055)	8987 9477	8665 9370 9995	8664 8730 9534	9714	9634	NIL	8600 8653 9049	NIL

							9190 9479 9802	
nsp5 (10056-10973)	NIL	NIL	10301	NIL	10081	10624	10762 10870 10905	10523 10670
nsp6 (10974-11843)	11191 11515 11809	11233	NIL	NIL	11742	NIL	11042 11222 11335 11376 11417	11083 11207
nsp7 (11844-12092)	NIL	NIL	NIL	NIL	NIL	NIL	12052	12041 12079
nsp8 (12093-12686)	NIL	NIL	NIL	NIL	12148	12471	12131 12361 12491	12160 12355 12514 12660 12685
nsp9 (12687-13025)	12910	NIL	12897	NIL	NIL	NIL	12704 12773 12793	NIL
nsp10 (13026-13442)	NIL	NIL	13130	NIL	13265 13419	NIL	13118 13201 13348	NIL
nsp11 (13443-13481)	NIL	NIL	NIL	NIL	NIL	NIL	13459	NIL
nsp12 (13482-16328)	14429 15354 15983	13954 15927 16272	14006 14425 15712	NIL	13693 13951 14012 15498 15869	14041 15033 15641 15765 15779	13571 13617 13627 13771 14028 14229 14290 14383 14500 14580 14718 15193 15380 15444 15672 15732 15906 15910 15919 15982 16075 16158	14277 16325
nsp13 (16329-18041)	17506 17574 17589	16456	17010 17059 17141 17410 17634	NIL	16387	17399	16377 16396 16535 16647 16700 16795 16852 16853 16858 16897 16912 16957 16975 17019 17079 17122 17193 17259 17278 17280 17302 17338 17427 17509 17562 17679 17686 17808 17814 17944	NIL

nsp14 (18042-19622)	18689 18975 19015 19035 19452	18632 19026 19225	18086 18171	NIL	18163 18600	19175	18105 18106 18149 18186 18255 18281 18318 18325 18380 18583 18589 18653 18756 18762 18898 18907 18973 18985 19009 19072 19086 19254 19340 19414 19417 19481 19518 19542 19563	18984
nsp15 (19623-20660)	19632 20315	NIL	20031 20371	NIL	NIL	19963	19645 19656 19684 19825 19872 19999 20002 20014 20060 20062 20134 20433 20477 20578	NIL
nsp16 (20661-21554)	21146	21357	NIL	NIL	21404	NIL	20718 20931 21004 21123 21204 21225 21334 21452	20980 20991 21255
geneS (21563-25384)	21568 21644 21784 22707 23119 24811	21584 21628 22303 23927 23952 24565	22033 22088 22783 22987 23220 23604 24096	21597 21658 21952 22224 24566	21944 22004 22215 22606 22920 23122 23416 23588 23992 24484 24694	21643 21825 22739 22922 23064 24069 25137	21600 21604 21641 21777 21795 21800 21824 21830 21850 22021 22030 22047 22051 22093 22104 22203 22335 22361 22468 22661 22698 22708 22918 23120 23224 23242 23311 23593 23678	21724 21974 22226 22973 23587 23755 25064 25145 25244 25273 25337

							23782 23856 23868 23909 24095 24197 24236 24348 24368 24755 24757 24794 24872 24914 24926 24928 25135 25177 25249 25250 25290 25302 25305 25311 25352 25354	
orf3a (25393-26220)	NIL	25554 25559 25649 25733 25962 26047 26181	25418 25546 25688 25771 25976	NIL	25806 26114 26126	25505 25575	25429 25459 25489 25494 25500 25523 25534 25555 25563 25598 25606 25621 25644 25677 25687 25691 25726 25740 25767 25770 25775 25819 25855 25906 25971 25979 26062 26063 26101 26109 26144	25471 25784 25785 25947
geneE (26245-26472)	26354 26359	NIL	NIL	26447	NIL	NIL	26458	NIL
geneM (26523-27191)	26756	27098	26934	26801	NIL	NIL	26526 26634 26690 26713 26727 26775 26849 26995 27147 27163	26720
orf6 (27202-27387)	27228	NIL	NIL	NIL	NIL	NIL	27217 27225 27226 27281 27327 27358 27382	NIL
orf7a (27394-27759)	NIL	27698	NIL	NIL	27690	NIL	27420 27461 27478	27506

							27670 27703	
orf8 (27894-28259)	NIL	28229	27925	NIL	NIL	28254	28001 28028 28044 28079 28083 28086 28089 28191 28221 28233	28027 28077 28090
geneN (28274-29533)	28340 28738 28963 29470 29515	29036	28289 28760 28821 28969	28896 29364	28910 28955 29154 29188 29301	28366 28692	28280 28337 28371 28378 28380 28392 28514 28541 28628 28655 28690 28703 28727 28739 28812 28827 28842 28845 28851 28857 28882 28895 28904 28908 28960 28979 28980 28985 29027 29162 29212 29254 29315 29392 29402 29431 29449 29462 29465 29474 29477 29511	28451 28899 28975
orf10 (29558-29674)	NIL	NIL	NIL	NIL	NIL	29567	29628	29543
3′ UTR (29675-29903)	29867	29847	29686 29870	NIL	29683 29806 29869	29873 29874	29705 29706 29711 29736 29745 29777 29779 29781	29734 29751

[1] All nucleotide positions are designated based on the 5’ to 3’ sequence of the 29,903 nucleotide RNA-genome (MN908947.3) of the reference strain from Wuhan, China.

Supplementary Figure

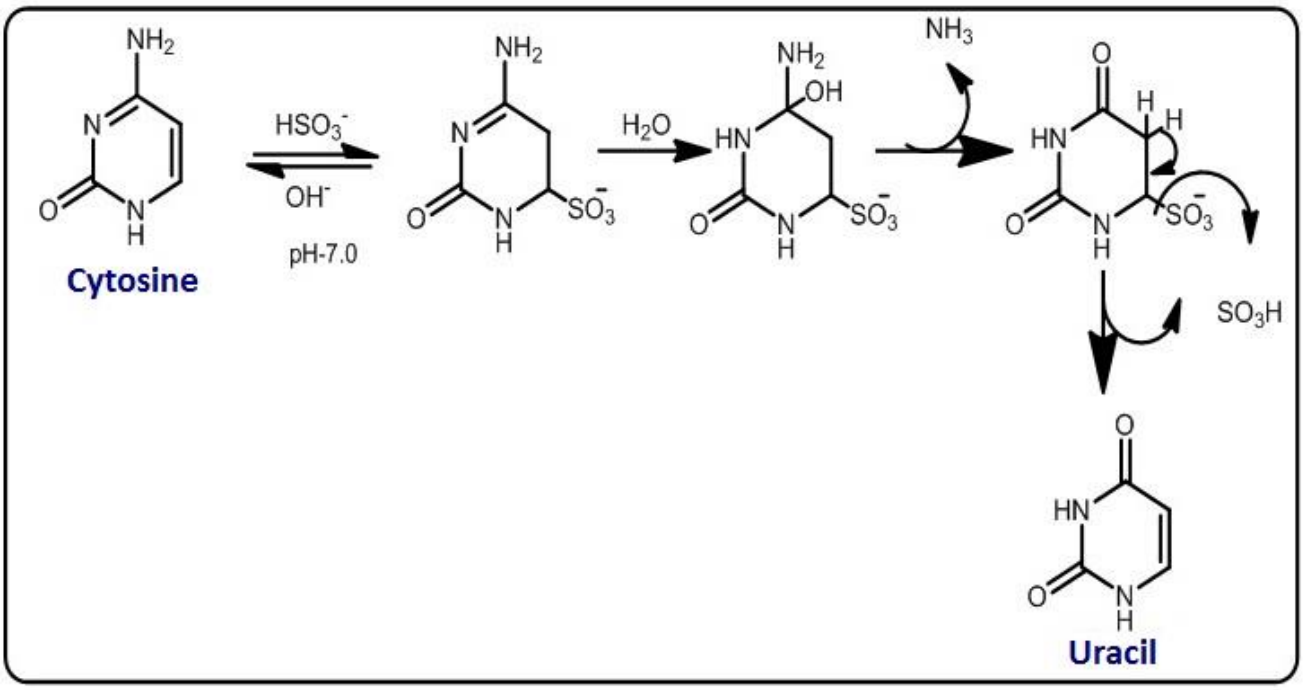

Figure S1. Probable chemical reactions that may lead to C→U transition (besides base changes due to replication errors). If the RNA within the virus is subjected to heat treatment (incubated for some time at 95°C) then sulfonated by sodium sulfite (sulfite, including sodium sulfite and sodium metabisulfite are used as disinfectant, antioxidant and preservative agent), at pH 7 and 65°C, the next step of hydrolytic deamination can occur at high pH and room temperature. In the final step, alkali desulfonation (alkaline brines and marinades are frequently employed in Chinese cuisines to alter the texture of meat or seafood) can take place to obtain uracil (for details see Hyatsu, 2008).

References used in the the legend of Figure S1

Hayatsu, H., 2008. Discovery of bisulfite-mediated cytosine conversion to uracil, the key reaction for DNA methylation analysis- A personal account. Proc. Jpn. Acad. Ser. B Phys. Biol. Sci. 84: 321-330. DOI: 10.2183/pjab/84.321.