

We gratefully acknowledge the following Authors from the Originating laboratories responsible for obtaining the specimens, as well as the Submitting laboratories where the genome data were generated and shared via GISAID, on which this research is based.

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EPI_ISL_434731, EPI_ISL_434732, EPI_ISL_434758, EPI_ISL_434760, EPI_ISL_434766, EPI_ISL_434775, EPI_ISL_434777, EPI_ISL_434788, EPI_ISL_434797, EPI_ISL_434801, EPI_ISL_434809, EPI_ISL_434810, EPI_ISL_434812, EPI_ISL_434813, EPI_ISL_434814, EPI_ISL_434825, EPI_ISL_434826, EPI_ISL_434827, EPI_ISL_434828, EPI_ISL_434829, EPI_ISL_434831, EPI_ISL_434835, EPI_ISL_434836, EPI_ISL_434840, EPI_ISL_434849, EPI_ISL_434855, EPI_ISL_434862, EPI_ISL_434867, EPI_ISL_434872, EPI_ISL_434873, EPI_ISL_434882, EPI_ISL_434884, EPI_ISL_434886, EPI_ISL_434891, EPI_ISL_434892, EPI_ISL_434902, EPI_ISL_434904, EPI_ISL_434905, EPI_ISL_434907, EPI_ISL_434916, EPI_ISL_434923, EPI_ISL_434924, EPI_ISL_434925, EPI_ISL_434932, EPI_ISL_434934, EPI_ISL_434953, EPI_ISL_434961, EPI_ISL_434964, EPI_ISL_434967, EPI_ISL_434969, EPI_ISL_434971, EPI_ISL_434974, EPI_ISL_434978, EPI_ISL_434981, EPI_ISL_434986, EPI_ISL_434987, EPI_ISL_435006, EPI_ISL_435010, EPI_ISL_435011, EPI_ISL_435013, EPI_ISL_435014, EPI_ISL_435015, EPI_ISL_435018, EPI_ISL_435026, EPI_ISL_435029		S. Wesley Long, Randall J. Olsen, Paul A. Christensen, David W. Bernard, James J. Davis, Maulik Shukla, Marcus Nguyen, Matthew Ojeda Saavedra, Concepcion C. Cantu, Prasanti Yerramilli, Layne Pruitt, Sishir Subedi, Heather Hendrickson, Ghazaleh Eskandari, Muthiah Kumaraswami, Jason S. McLellan, Hakon Jonsson, Karl Stefansson, and James M. Musser	
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EPI_ISL_457762, EPI_ISL_457767, EPI_ISL_457768, EPI_ISL_457782, EPI_ISL_457783, EPI_ISL_457789, EPI_ISL_457807, EPI_ISL_457813	Johns Hopkins Hospital Department of Pathology	Johns Hopkins Hospital Department of Pathology	Peter M. Thielen, Thomas Mehoke, Shirlee Wohl, Srividya Ramakrishnan, Melanie Kirsche, Amanda Ertlund, Craig Howser, Kristina Zudock, Oluwaseun Falade-Nwulia, Norah Sadowski, Paul Morris, Mark Hopkins, Yunfan Fan, Nidia Trovao, Victoria Gniazdowski, Michael C. Schatz, Stuart C. Ray, Winston Timp, Heba H. Mostafa
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EPI_ISL_508799, EPI_ISL_508801, EPI_ISL_508821, EPI_ISL_508849, EPI_ISL_508852, EPI_ISL_508855	Florida Bureau of Public Health Laboratories	Florida Bureau of Public Health Laboratories	Sarah Schmedes, Jason Blanton
EPI_ISL_509484, EPI_ISL_509485, EPI_ISL_509486	Maryland Department of Health	Maryland Department of Health	Keller,E.
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EPI_ISL_542488, EPI_ISL_542492, EPI_ISL_542509, EPI_ISL_542517, EPI_ISL_542542, EPI_ISL_542562, EPI_ISL_542573, EPI_ISL_542587, EPI_ISL_542603, EPI_ISL_542619, EPI_ISL_542628, EPI_ISL_542661, EPI_ISL_542664, EPI_ISL_542665, EPI_ISL_542674, EPI_ISL_542684, EPI_ISL_542705, EPI_ISL_542710, EPI_ISL_542717, EPI_ISL_542723, EPI_ISL_542724, EPI_ISL_542729, EPI_ISL_542731, EPI_ISL_542732, EPI_ISL_542745, EPI_ISL_542765, EPI_ISL_542775, EPI_ISL_542792, EPI_ISL_542803, EPI_ISL_542807, EPI_ISL_542831, EPI_ISL_542839, EPI_ISL_542908, EPI_ISL_543724, EPI_ISL_543745, EPI_ISL_543863, EPI_ISL_543910, EPI_ISL_543957, EPI_ISL_544296, EPI_ISL_544585, EPI_ISL_544588, EPI_ISL_544705, EPI_ISL_545143, EPI_ISL_545317, EPI_ISL_545336, EPI_ISL_545653, EPI_ISL_545849, EPI_ISL_545852, EPI_ISL_545887, EPI_ISL_545908, EPI_ISL_545916, EPI_ISL_545917, EPI_ISL_545925, EPI_ISL_545940, EPI_ISL_545947, EPI_ISL_545953, EPI_ISL_546214, EPI_ISL_546565, EPI_ISL_546747, EPI_ISL_546797, EPI_ISL_546810, EPI_ISL_546913, EPI_ISL_546940, EPI_ISL_546952, EPI_ISL_546959			
see above	Houston Methodist Hospital	Houston Methodist Hospital	S. Wesley Long, Randall J. Olsen, Paul A. Christensen, David W. Bernard, James J. Davis, Maulik Shukla, Marcus Nguyen, Matthew Ojeda Saavedra, Concepcion C. Cantu, Prasanti Yerramilli, Layne Pruitt, Sishir Subedi, Hung-Che Kuo, Heather Hendrickson, Ghazaleh Eskandari, Hoang A. T. Nguyen, J. Hunter Long, Muthiah Kumaraswami, Jule Goike, Daniel Boutz, Jimmy Gollihar, Jason S. McLellan, Chia-Wei Chou, Kamyab Javanmardi, Ilya J. Finkelstein, and James M. Musser
EPI_ISL_560806	Maryland Public Health Laboratory	Maryland Public Health Laboratory	Maryland Department of Health Laboratories Administration
EPI_ISL_561346	Delaware Public Health Lab	Delaware Public Health Lab	Gregory Hovan
EPI_ISL_571171, EPI_ISL_571286, EPI_ISL_571289, EPI_ISL_571293, EPI_ISL_571294, EPI_ISL_571295, EPI_ISL_571528, EPI_ISL_571598, EPI_ISL_571902, EPI_ISL_571903, EPI_ISL_571939, EPI_ISL_572036, EPI_ISL_572038			
see above	Quest Diagnostics	Quest Diagnostics	Rosenthal,S.H., Gerasimova,A., Kagan,R.M., Anderson, B., Grover, D., Livingston, K.E., Hua, M., Liu Y., Shalhout, D.F., Owen, R., Lacbawan, F.
EPI_ISL_575103	Utah Public Health Laboratory	Utah Public Health Laboratory	Erin Young, Kelly Oakeson
EPI_ISL_576163	Delaware Public Health Lab	Delaware Public Health Lab	Gregory Hovan
EPI_ISL_576178	DC Public Health Lab/ Dept. of Forensic Sciences	Pathogen Discovery, Respiratory Viruses Branch, Division of Viral Diseases, Centers for Disease Control and Prevention	Ying Tao, Jing Zhang, Brian Lynch, Yan Li, Krista Queen, Anna Uehara, Clinton R. Paden, Peter Cook, Haibin Wang, Suxiang Tong
EPI_ISL_578361, EPI_ISL_578459	Wisconsin State Laboratory of Hygiene Communicable Disease Division	Wisconsin State Laboratory of Hygiene Communicable Disease Division	Kelsey R. Florek, Abigail C. Shockey
EPI_ISL_579237	LabPLUS	Institute of Environmental Science and Research (ESR)	Xiaoyun Ren, Matt Storey, Nikki Freed, Muhammad Faisal, Jing Wang, Hermes Perez, Anja Werno, Antje van der Linden, Arlo Upton, Chris Mansell, David Hammer, Dragana Drinkovic, Gary McAuliffe, Hana Sofia Andersson, James Ussher, Jill Sherwood, Josh Freeman, Julia Howard, Juliet Elvy, Mary DeAlmeida, Matt Blakiston, Matthew Rogers, Max Bloomfield, Michael Addidle, Michelle Balm, Sally Roberts, Sarah Jefferies, Sharmini Muttaiyah, Susan Morpeth, Susan Taylor, Timothy Blackmore, Vani Sathyendran, Veronica Playle, Virginia Hope, Erasmus Smit, Lauren Jelly, Olin Silander, Joep de Ligt
EPI_ISL_579570	QEII Health Sciences Centre	National Microbiology Laboratory (NML)	Anna Majer, Shari Tyson, Grace Seo, Philip Mabon, Darian Hole, Elsie Grudeski, Rhiannon Huzarewich, Russell Mandes, Anneliese Landgraff, Jennifer Tanner, Natalie Knox, Morag Graham, Gary Van Domselaar, Todd Hatchette, Jason LeBlanc, Nathalie Bastien, Yan Li, Timothy Booth, CanCOGeN's metadata curation team, Public Health Agency of Canada's CanCOGeN team
EPI_ISL_594090	Utah Public Health Laboratory	Utah Public Health Laboratory	Erin Young, Kelly Oakeson
EPI_ISL_603781, EPI_ISL_603847, EPI_ISL_603851, EPI_ISL_603872, EPI_ISL_603969, EPI_ISL_604025, EPI_ISL_604093, EPI_ISL_604144, EPI_ISL_604151, EPI_ISL_604308, EPI_ISL_604310, EPI_ISL_604319, EPI_ISL_604326, EPI_ISL_604486, EPI_ISL_604551, EPI_ISL_604695, EPI_ISL_604697, EPI_ISL_604853, EPI_ISL_604865, EPI_ISL_604931, EPI_ISL_604969			
see above	Quest Diagnostics	Quest Diagnostics	Rosenthal,S.H., Gerasimova,A., Kagan,R.M., Anderson, B., Grover, D., Livingston, K.E., Hua, M., Liu Y., Shalhout, D.F., Owen, R., Lacbawan, F.
EPI_ISL_613757, EPI_ISL_613765, EPI_ISL_613915, EPI_ISL_613932, EPI_ISL_613934, EPI_ISL_613943, EPI_ISL_613944, EPI_ISL_613945, EPI_ISL_613946, EPI_ISL_613947, EPI_ISL_613948			
see above	Florida Bureau of Public Health Laboratories	Florida Bureau of Public Health Laboratories	Sarah Schmedes, Jason Blanton
EPI_ISL_626434, EPI_ISL_626464	Northwestern Memorial Hospital	Ozer Lab	Ramon Lorenzo-Redondo, Hannah H. Nam, Scott C. Roberts, Lacy M. Simons, Chad J. Achenbach, Lawrence J. Jennings, Chao Qi, Alan R. Hauser, Michael G. Ison, Judd F. Hultquist, Egon A. Ozer
EPI_ISL_631808	Wyckoff Heights Medical Center	New York City Public Health Laboratory	Jade Wang, et al.
EPI_ISL_631816	Richmond University Medical Center	New York City Public Health Laboratory	Jade Wang, et al.
EPI_ISL_644171	Texas Department of State Health Services	Texas Department of State Health Services	Rashmi Tuladhar, Bonnie Oh, Jenny Zhang, Maliha Rahman, Anita Pokharel, Myong Koag, Chung Wang, Rachel Lee, Grace Kubin, Mayela Pedrueza
EPI_ISL_648020, EPI_ISL_648026	MS Public Health Laboratory	Pathogen Discovery, Respiratory Viruses Branch, Division of Viral Diseases, Centers for Disease Control and Prevention	Yan Li, Jing Zhang, Ying Tao, Brian Lynch, Krista Queen, Anna Montmayeur, Anna Uehara, Clinton R. Paden, Rachel Marine, Haibin Wang, Suxiang Tong
EPI_ISL_653098, EPI_ISL_653125, EPI_ISL_653126, EPI_ISL_653127, EPI_ISL_653128, EPI_ISL_653147, EPI_ISL_653148	Florida Bureau of Public Health Laboratories	Florida Bureau of Public Health Laboratories	Sarah Schmedes, Jason Blanton
EPI_ISL_696446	Sonora Quest Laboratories, Laboratory Sciences of Arizona	TGen North	Jolene Bowers, Megan Folkerts, Chris French, Hayley Yaglom, Ashlyn Pfeiffer, Darrin Lemmer, Dave Engelthaler, The Arizona COVID Genomics Union (ACGU)
EPI_ISL_754748, EPI_ISL_754759, EPI_ISL_754760, EPI_ISL_754762, EPI_ISL_754764, EPI_ISL_754769, EPI_ISL_754776	Emory Molecular Diagnostics Laboratory, Emory Healthcare	Piantadosi Lab, Emory Department of Pathology	Ahmed Babiker, Anne Piantadosi

EPI_ISL_788610	Houston Methodist Hospital	Houston Methodist Hospital	S. Wesley Long, Randall J. Olsen, Paul A. Christensen, David W. Bernard, James J. Davis, Maulik Shukla, Marcus Nguyen, Matthew Ojeda Saavedra, Prasanti Yerramilli, Layne Pruitt, Sishir Subedi, Heather Hendrickson, and James M. Musser
EPI_ISL_791818	Massachusetts General Hospital	Infectious Disease Program, Broad Institute of Harvard and MIT	Lemieux,J.E., Siddle,K.J., Shaw,B., Adams,G., Pierce,V., Turbett,S., Anahtar,M., Branda,J., Slater,D., Harris,J., Lin,A.E., Gladden-Young,A., Lagerborg,K., Rudy,M., DeRuff,K., Carter,A., Normandin,E., Bauer,M., Reilly,S., Tomkins-Tinch,C., Loreth,C., Chaluvadi,S., Neumann,A., Cusick,C., Chapman,S.B., Gnirke,A., Flowers,K., Cerrato,F., Birren,B.W., Gallagher,G., Smole,S., Park,D.J., Macinnis,B.L., Ryan,E., LaRocque,R., Rosenberg,E. and Sabeti,P.C.
EPI_ISL_804863	DC Public Health Lab/ Dept. of Forensic Sciences	DC Public Health Lab/ Dept. of Forensic Sciences	Scott Nguyen, Elizabeth Zelaya, Connie Maza, Monica Mann, Brittany Hamilton, David Payne, Jocelyn Hauser
EPI_ISL_806416	Alberta Precision Labs (APL)	Alberta Precision Labs (APL)	Gordon P, Lam LG, Pabbaraju K, Wong A, Ma R, Li V, Melin A, Tipples G, Berenger B, Zelyas N, Kellner J, Bernier F, Chui L, Croxen M
EPI_ISL_812308	United States Air Force School of Aerospace Medicine	United States Air Force School of Aerospace Medicine	Anthony Fries, Jennifer Meyer, Amanda Javorina, Sarah Purves, William Gruner, Clarise Starr, Elizabeth Macias
EPI_ISL_848251, EPI_ISL_848474	Illinois Department of Public Health	Gagnon Lab, Southern Illinois University	Keith Gagnon
EPI_ISL_855282	Institute for Computational Biomedicine, Weill Cornell Medicine	Institute for Computational Biomedicine, Weill Cornell Medicine	Butler,D.J., Mozsary,C., Meydan,C., Danko,D., Foox,J., Rosiene,J., Shaiber,A., Afshinnekoo,E., MacKay,M., Sedlazeck,F.J., Ivanov,N.A., Sierra,M., Pohle,D., Zietz,M., Gisladottir,U., Ramlall,V., Westover,C.D., Ryon,K., Young,B., Bhattacharya,C., Ruggiero,P., Langhorst,B.W., Tanner,N., Gawrys,J., Meleshko,D., Xu,D., Steel,P.A.D., Shemesh,A.J., Xiang,J., Thierry-Mieg,J., Thierry-Mieg,D., Schwartz,R.E., Iftner,A., Bezdán,D., Sipley,J., Cong,L., Craney,A., Velu,P., Melnick,A.M., Hajirasouliha,I., Horner,S.M., Iftner,T., Salvatore,M., Loda,M., Westblade,L.F., Cushing,M., Levy,S., Wu,S., Tatonetti,N., Imielinski,M., Rennert,H., Mason,C.E.
EPI_ISL_877597	Clinical Molecular Microbiology Laboratory, UNC Hospital	Dirk Dittmer	Razia Moorad , Justin T. Landis , Brent A. Eason, Melissa B. Miller, Linda Pluta, Dirk Dittmer, Angelica Juarez, Cecilia Thompson , Cameroon Grant, Evelyn Hoffman, Patricio Cano, Jason Wong, Carolina Caro-Vegas, Blossom Damania.
EPI_ISL_884541, EPI_ISL_884549, EPI_ISL_884552	Molecular Microbiology & Immunology, University of Missouri	Molecular Microbiology & Immunology, University of Missouri	Tang,C.Y., Li,T., Hang,J., Lidl,G.M., Wan,X.-F.
EPI_ISL_890488, EPI_ISL_890588, EPI_ISL_890798	Laboratoire de santé publique du Québec	Laboratoire de santé publique du Québec	Sandrine Moreira, Ioannis Ragoussis, Guillaume Bourque, Jesse Shapiro, Mark Lathrop and Michel Roger on behalf of the CoVSeQ research group (http://covseq.ca/researchgroup)
EPI_ISL_911470	Clinical Diagnostics Laboratory, Diagnostic & Experimental Pathology, Lilly Research Laboratories	Clinical Diagnostics Laboratory, Diagnostic & Experimental Pathology, Lilly Research Laboratories	Tim Holzer, Mayuri Vaidya, Angie Fulford, Sam McNeely, Rachael Redmond, Phil Ebert, John Calley, Leslie O'Neill Reising, Pat Finnegan, Erin Wray, John McElwee, Jeff Fill, Joe Oakley, Andrew Schade
EPI_ISL_914865	Virginia Division of Consolidated Laboratory Services (DCLS)	Virginia Division of Consolidated Laboratory Services (DCLS)	Virginia DCLS
EPI_ISL_936497, EPI_ISL_936513	Northwestern Memorial Hospital	Ozer Lab	Ramon Lorenzo-Redondo, Lacy M. Simons, Chad J. Achenbach, Lawrence J. Jennings, Michael G. Ison, Judd F. Hultquist, Egon A. Ozer
EPI_ISL_956201	Pathology and Laboratory Medicine Institute, Cleveland Clinic, Ohio, USA	Pathology and Laboratory Medicine Institute, Cleveland Clinic, Ohio, USA	Frank P. Esper, Yu-Wei Cheng, Thamali M. Adhikari, Zheng Jin Tu, Daniel H. Farkas, Gary Procop, Jennifer Ko, Timothy A. Chan, Jing Li, Brian P. Rubin
EPI_ISL_968176, EPI_ISL_968178, EPI_ISL_968182	Clinical Molecular Microbiology Laboratory, UNC Hospital	Dirk Dittmer	Justin T. Landis , Razia Moorad , Brent A. Eason, Melissa B. Miller, Linda Pluta, Dirk Dittmer, Angelica Juarez, Cecilia Thompson, Shawn Hawken, Cameroon Grant, Evelyn Hoffman, Patricio Cano, Jason Wong, Carolina Caro-Vegas, Ryan McNamara, Blossom Damania.