Genome sequence of enterovirus D68 from St. Louis, Missouri, USA

Kristine M. Wylie
Washington University School of Medicine in St. Louis

Todd N. Wylie
Washington University School of Medicine in St. Louis

Anthony Orvedahl
Washington University School of Medicine in St. Louis

Richard S. Buller
Washington University School of Medicine in St. Louis

Brandi N. Herter
Washington University School of Medicine in St. Louis

See next page for additional authors

Follow this and additional works at: https://digitalcommons.wustl.edu/open_access_pubs

Recommended Citation
Wylie, Kristine M.; Wylie, Todd N.; Orvedahl, Anthony; Buller, Richard S.; Herter, Brandi N.; Magrini, Vincent; Wilson, Richard K.; and Storch, Gregory A., "Genome sequence of enterovirus D68 from St. Louis, Missouri, USA." Emerging Infectious Diseases. 21, 1. 184-186. (2015).
https://digitalcommons.wustl.edu/open_access_pubs/3598

Please let us know how this document benefits you.
Authors
Kristine M. Wylie, Todd N. Wylie, Anthony Orvedahl, Richard S. Buller, Brandi N. Herter, Vincent Magrini, Richard K. Wilson, and Gregory A. Storch
To the Editor: During the current (2014) enterovirus/rhinovirus season in the United States, enterovirus D68 (EV-D68) is circulating at an unprecedented level. As of October 6, 2014, the Centers for Disease Control and Prevention (CDC) had confirmed 594 cases of EV-D68 infection in 43 states and the District of Columbia (http://www.cdc.gov/non-polio-enterovirus/outbreaks/EV-D68-outbreaks.html); the actual number of cases was undoubtedly much higher. In mid-August, hospitals in Missouri and Illinois noticed an increased number of patients with severe respiratory illness (∗). We observed this pattern at St. Louis Children’s Hospital in St. Louis, Missouri.

Resources for studying this virus are limited. Before the current season, only 7 whole-genome sequences and 5 additional complete coding sequences of the virus were available. Therefore, determining whether there are genomic elements associated with rapid spread or severe and unusual disease was not possible.

To address these limitations, we determined the complete coding sequence of 1 strain from St. Louis by using high-throughput sequencing technology. Sequence data were generated on an Illumina HiSeq 2500. The sequence was deposited in GenBank under accession no. KM881710, BioProject PRJNA263037.

For 14 of the 17 samples, high-throughput sequencing data were interpretable (online Technical Appendix Table); for the other 3 samples, the number of virus sequence reads was too low to distinguish them from sample cross-talk, which occurs during high-throughput sequencing analysis (6). Of the 14 typed samples, EV-D68 sequences were detected in 7 of 10 samples from patients with severe disease, 2 of 2 with moderate disease, and 0 of 2 with mild disease. The complete coding sequence was assembled from sample EV-D68_STL_2014_12. The most closely related genomes from previous seasons were Thailand, CU134, and CU171 (∗) (Figure, panel A). Several of the genome sequences obtained from Missouri strains from this season, which had been sequenced by CDC, were very similar to this genome sequence. Comparison of the virus protein 1 sequence with...
that of publicly available sequences indicated that the strain from St. Louis and the strain from Missouri (CDC) cluster with virus strains identified in Europe and Asia within the past several years (Figure 1, panel B). The St. Louis virus shared 97%–99% aa sequence identity with all other sequenced strains. We observed little variation in the strains from St. Louis because they shared 98%–99% nt sequence identity (online Technical Appendix Figure).

We provide a genome sequence from the 2014 outbreak of EV-D68 infection in St. Louis, Missouri. This sequence seems to be highly representative of the strains circulating in St. Louis during this time because the other genomes we partially sequenced are very similar. To our knowledge, no amino acids have been associated with virulence or increased infectivity of EV-D68; therefore, we cannot associate the changes we observed in these genomes with these characteristics.

Figure. Phylogenetic comparison of enterovirus D68 (EV-D68) obtained from St. Louis, Missouri, USA, in 2014, with other sequenced strains. The phylogenetic relationships of genome sequences (nucleotides) were estimated by using the maximum-likelihood method with RAxML (http://www.viprbrc.org) bootstrapped 100 times. A) Comparison of genome sequences for full-length and nearly full-length strains. B) Comparison of virus protein 1 sequences. Sequences were downloaded from ViPR (http://www.viprbrc.org) and supplemented with strains from the 2014 EV-D68 season. Sequences were clustered at 99% identity to obtain a representative set of sequences, which are shown. Bootstrap values are indicated on each tree. The strain from St. Louis is indicated by an asterisk on each tree. Scale bars indicate nucleotide substitutions per site.
to phenotypic traits. Because changes in the 5′ untranslated region have the potential to affect the rate of replication (8–10), it is possible that minor genome changes are responsible for the rapid spread and high severity of disease in 2014. Correlation between clinical features of patients in conjunction with additional genomic analysis might provide further insight into the pathogenetic determinants of this strain. Therefore the genome sequence of EV-D68 determined from the 2014 outbreak in St. Louis, Missouri, provides a resource for tracking and genomic comparison of this rapidly spreading virus.

Acknowledgments
We thank Stephanie Bledsoe for her assistance with obtaining samples from the virology laboratory at St. Louis Children’s Hospital and Maria Cannella and Sheila Mason for their assistance with PCR assays. We thank The Genome Institute staff for their assistance with sequencing and data submission, particularly Lucinda Fulton, Debbie Moeller, Joanne Nelson, Sean McGrath, and Amy Ly.

This work was funded by the Alan A. and Edith L. Wolff Distinguished Professorship (to R.K.W.) and R01AI097213 (to G.A.S.).

References


Prisoners Treated for Hepatitis C with Protease Inhibitor, New York, USA, 2012

Harish Moorjani, Carl Koenigsmann, Min Jung Kim, and Anne C. Spaulding

Author affiliations: New York Medical College, Valhalla, New York, USA (H. Moorjani); New York State Department of Corrections and Community Supervision, Albany, New York, USA (C. Koenigsmann); and Emory University, Atlanta, Georgia, USA (M.J. Kim, A.C. Spaulding)

DOI: http://dx.doi.org/10.3201/eid2101.141025

To the Editor: Globally, epidemics of infection with hepatitis C virus (HCV) tend to be concentrated in correctional facilities, according to a review of worldwide literature during 1990–2012 (1,2). Nearly 1 in 3 persons infected with HCV in the United States spends at least part of each year in either a prison or jail (3). Proficiency by correctional health facilities in hepatitis C treatment by using the most effective agents may mitigate the predicted burden of end-stage liver disease and hepatocellular cancer in the coming years. The first wave of direct-acting agents against HCV had substantial side effects. Nonetheless, the New York Department of Corrections and Community Supervision (NYDOCCS) systematically approached the challenge of using these agents, and their experience serves as a lesson that prison medical services can overcome substantial barriers to care.

In 2011, NYDOCCS piloted a hepatitis C treatment program for HCV genotypes 1a and 1b, comprised of telaprevir, pegylated interferon, and ribavirin. Patients underwent extensive mandatory pretreatment screening for mental health issues, pregnancy, and cirrhosis by using the FibroSURE assay (LabCorp, Burlington, NC, USA) and Doppler sonogram of the portal vein. Eligibility requirements were a negative HIV test result, and liver fibrosis assessed either by liver biopsy or noninvasively, at METAVIR stage 2 or 3, or 4 (reference range 0–4) (4) with compensation. A patient in stage 1 was eligible if the patient had poor prognostic factors. An infectious disease consultant saw every patient; each patient received mandatory patient education. Mandatory conditions for patients participating in the program were to sign a consent