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Complete Genome Sequence of a Newly Identified Porcine Astrovirus Genotype 3 Strain US-MO123

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Astroviruses (AstV) are nonenveloped, single-stranded, positive-sense RNA viruses of the family of Astroviridae (3) and have been isolated from feces of a wide variety of mammals and birds (1, 3). In most species, these viruses are associated with gastroenteritis in young individuals; however, in some birds and animals, these viruses have been associated with extraintestinal diseases (1–4, 8). Since the first porcine astrovirus (PAstV) was detected in pigs in the 1980s (4), five genotypes of PAstV have been identified (6, 7, 9), but an association with clinical disease still remains unclear.

Herein, PAstV genotype 3 (PAstV3) RNA was identified by real-time PCR in a fecal sample of a pig suffering from diarrhea and subsequently sequenced with detection primers based on a conserved region. As PAstV may play a role in diarrhea or other clinical manifestations in pigs, the genome features of the PAstV3 strain designated US-MO123 were characterized.

First, the 3′ partial genome of US-MO123 was obtained using primers based on the known partial genome of PAstV3. The 5′ partial genome was obtained using degenerate primers based on the alignment of human and mink AstV genomes which previously showed the closest relationship to PAstV3 (9). The 5′ and 3′ terminals of the genome were acquired by using a rapid amplification of cDNA ends (RACE) kit (TaKaRa, Japan). The obtained complete genome of PAstV3 possesses a typical AstV organization, with a size of 6,430 bp excluding the poly(A) tail and a GC content of 47.1%. Three main open reading frames (ORFs) are predicted, with a short 5′ untranslated region (UTR) of 30 bp and a 3′ UTR of 82 bp. ORF1a (bp 31 to 2,565) and ORF2 (bp 3,895 to 6,348) encode proteins of 844 amino acids (aa) and 817 aa, respectively. Translation of ORF1b (bp 2,562 to 4,091) may be linked to ORF1a by a ribosomal frame-shifting mechanism, resulting in a polyprotein (ORF1ab) of 1,553 aa. The whole genome of US-MO123 shows low identities of 38.4% to 42.7% with the known genomes of PAstV1 (GenBank accession no. GQ914773), PAstV2 (GenBank accession no. JF713710), PAstV4 (GenBank accession no. JF713713), and PAstV5 (GenBank accession no. JF713711) and showed an identity of 91.8% with the only known partial genome of PAstV3 strain 16-2 (2,931 bp; GenBank accession no. HM756261).

Phylogenetic analysis based on the ORF2 gene sequences revealed that PAstV3 has the closest relationship with mink AstV and the human AstV strains VA1, VA2, and SG (9). Mink AstV was reported to be associated with shaking mink syndrome (2), while the human strain VA1 was associated with an outbreak of acute gastroenteritis in a child care center (5) and SG was reported as a causative agent for encephalitis in a boy with agammaglobulinemia (8). The genome of PAstV3 has higher identities of 50.5% to 55.3% with mink AstV and the human AstV strains VA1, VA2, and SG than with other PAstV genotypes, indicating the same origin for PAstV3, mink AstV, and human AstVs. However, the potential role of PAstV3 in clinical manifestations in pigs and the zoonotic potential need further investigation.

Nucleotide sequence accession number. The complete genome sequence of PAstV3 strain US-MO123 has been deposited in GenBank under the accession no. JX556691.

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REFERENCES