

# Adenovirus Type 21–Associated Acute Flaccid Paralysis during an Outbreak of Hand-Foot-and-Mouth Disease in Sarawak, Malaysia

Mong How Ooi,<sup>1</sup> See Chang Wong,<sup>1</sup> Daniela Clear,<sup>3</sup> David Perera,<sup>2</sup> Shekhar Krishnan,<sup>1</sup> Teresa Preston,<sup>4</sup> Phaik Hooi Tio,<sup>2</sup> Hugh J. Willison,<sup>6</sup> Brian Tedman,<sup>4</sup> Rachel Kneen,<sup>3</sup> Mary Jane Cardoso,<sup>2</sup> and Tom Solomon<sup>3,5,a</sup>

<sup>1</sup>Department of Paediatrics, Sibul Hospital, Sibul, and <sup>2</sup>Institute of Health and Community Medicine, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia; Departments of <sup>3</sup>Neurological Science and <sup>4</sup>Neurophysiology, Walton Centre for Neurology and Neurosurgery, and <sup>5</sup>Department of Medical Microbiology and Genitourinary Medicine, Duncan Building, University of Liverpool, Liverpool, England; and <sup>6</sup>University Department of Neurology, Institute of Neurological Sciences, Southern General Hospital, Glasgow, Scotland, United Kingdom

**We report the virological and clinical features of 8 children who presented with adenovirus-associated acute flaccid paralysis (AFP) during an epidemic of enterovirus type 71 (EV71)–associated hand-foot-and-mouth disease (HFMD) in Sarawak, Malaysia, in 1997. Neutralization tests and phylogenetic analysis revealed adenovirus type 21 (Ad21), although DNA restriction digests suggested that this virus was different from the prototype Ad21. Four children had upper-limb monoparesis, 2 had lower-limb monoparesis (one of whom had changes in the anterior spinal cord noted on magnetic resonance imaging), and 2 had flaccid paraparesis. At follow-up, 4 children were noted to have made full recoveries and 3 had residual flaccid weakness and wasting. Neurophysiological investigation revealed a mixture of axonal and demyelinating features in motor and sensory nerves, with denervation. These findings suggest that Ad21 might cause AFP by anterior horn cell damage or neuropathy of the brachial or lumbosacral plexus. The occurrence of these unusual adenovirus infections during an outbreak of EV71-associated HFMD suggests that an interaction between the 2 viruses may have occurred.**

With the decrease in the number of cases of polio in the tropics, attention has moved to other causes of acute flaccid paralysis (AFP). In 1997, there was an unexpected increase in the number of children with AFP who presented to Sibul Hospital (Sarawak, Malaysia).

The cases occurred during an outbreak of hand-foot-and mouth disease (HFMD) across Sarawak, and they coincided with an unexplained cluster of children with acute fatal myocardial dysfunction [1]. Although the outbreak of HFMD was clearly caused by enterovirus type 71 (EV71), obtaining a consensus on the cause of the cases involving paralysis and fatal cardiac cases has proven to be difficult [2, 3]. The clinical and pathological characteristics of the fatal cardiac cases have been described in detail elsewhere [4]. Here, we focus on the cases involving paralysis.

Although EV71 is known to cause polio-like flaccid paralysis, virological and epidemiological investigations conducted during this outbreak of disease showed that the virus that was most closely associated with the cases of AFP and myocarditis at Sibul Hospital was a species B human adenovirus [1]. As has been described else-

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<sup>a</sup> Present affiliation: World Health Organization Center for Tropical Diseases, University of Texas Medical Branch, Galveston, Texas.

Reprints or correspondence: Dr. Tom Solomon, Dept. of Neurological Science, University of Liverpool, Walton Centre for Neurology and Neurosurgery, Lower Lane, Fazakerley, Liverpool L9 7LJ, United Kingdom (tsolomon@liv.ac.uk).

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