Jpn. J. Infect. Dis., 63, 2010

Laboratory and Epidemiology Communications

A Case of Paralytic Poliomyelitis Associated with Poliovirus Vaccine Strains in Hokkaido, Japan

Masahiro Miyoshi, Shima Yoshizumi, Masaru Jinushi, Setsuko Ishida, Toyo Okui[1], Motohiko Okano, Masayo Shouji[2], Sanae Tanaka[2], Junichi Saigusa[3], Akihisa Mori[4], Hiroki Tanabe[5], Ryo Yamaguchi[5], Yorihiro Nishimura[6], and Hiroyuki Shimizu[6]*

Hokkaido Institute of Public Health, Sapporo 060-0819;
[1]School of Veterinary Medicine, Rakuno Gakuen University, Ebetsu 069-8501;
[2]Sorachi Public Health and Social Welfare Office, Iwamizawa 068-8558;
[3]Kamikawa Public Health and Social Welfare Office, Asahikawa 079-8610;
[4]Iburi Public Health and Social Welfare Office, Muroran 051-8555;
[5]Department of Health and Welfare, Hokkaido Government, Sapporo 060-8588; and
[6]Department of Virology II, National Institute of Infectious Diseases, Tokyo 208-0011, Japan

Communicated by Takaji Wakita

(Accepted March 23, 2010)

On December 3, 2007 in Hokkaido, a male infant aged 6 months old presented with fever (39.0°C), and on December 6, subsequently developed acute flaccid paralysis of the lower extremities with reduced physical activity and suckling defect. The patient had received his first dose of oral poliovirus vaccine (OPV) 20 days before the onset of paralysis and had neither immunological abnormalities nor history of travel to foreign countries including polio-endemic areas. He was admitted to a regional hospital, and clinical information on the patient was reported to the Kamikawa Public Health and Social Welfare Office as a suspected case of poliomyelitis.

To address the possibility of vaccine-associated paralytic poliomyelitis (VAPP), clinical samples were collected from the patient 6–13 days after the onset of paralysis, and virus isolation and identification were conducted at the Hokkaido Institute of Public Health and the National Institute of Infectious Diseases. Polioviruses were isolated from stool samples, which were collected 6–9 days after the onset of paralysis (26–29 days after the OPV administration), and virus isolation was performed using Vero, A549, CaCo-2, RD, and HEp-2 cells. The inoculated cells were examined everyday for 14 days for evidence of a cytopathic effect. Furthermore, L20B cells, highly susceptible to polioviruses (1), were also used for virus isolation during the same period. All isolates from stool samples were finally identified as type 2 and type 3 polioviruses by the microneutralization test (1). For the intratypic differentiation of polioviruses to distinguish between vaccine and wild polioviruses, we determined the sequence of the entire VP1 region of the type 2 and type 3 poliovirus isolates. As shown in Table 1, sequence analysis demonstrated that the isolates have less than 1.0% nucleotide diversity from the parental Sabin strains. Thus, both type 2 and type 3 poliovirus isolates were identified as Sabin-like polioviruses, which were commonly found in the stool samples from OPV recipients and their close contacts, including healthy individuals and VAPP patients (2). Cerebrospinal fluid (CSF) was negative for viruses by virus isolation, and enterovirus-specific RNA was not detected from the CSF samples by a seminested reverse transcription-PCR either (3). During clinical follow-up, the patient continued to have residual paralysis. From clinical, epidemiological, and virological points of view, the patient was finally reported to the Public Health and Social Welfare Office as a highly suspected case of VAPP, which, according to the Infectious Diseases Control Law in Japan, is one of the Category II infectious diseases. Active surveillance was carried out for his family, close contacts, and other OPV recipients in the surrounding areas, however no infants with acute flaccid paralysis were found. Furthermore, no fundamental problems with the OPV immunization status or quality of OPV products have been identified.

Although Japan has maintained a polio-free status since the identification of a wild type 3 poliovirus in 1993, suspected VAPP cases have consistently been reported in OPV recipients and their close contacts (4–7). The overall risk for VAPP in Japan was estimated to be one case per 2.0 million OPV doses (7). To reduce the inherent risks of OPV, VAPP, and polio outbreaks due to vaccine-derived polioviruses, in 2003 the Subcommittee on Polio and Measles Vaccination recommended the introduction of inactivated poliovirus vaccine (IPV), instead of OPV, in Japan (8). However, as of 2009, no IPV containing vaccine products have been licensed in Japan (9). Further polio vaccination strategies in Japan, including early introduction of IPV, should be seriously and urgently considered to minimize the risk of VAPP (10).

*Corresponding author: Mailing address: Department of Virology II, National Institute of Infectious Diseases, Gakuen 4-7-1, Musashimurayama-shi, Tokyo 208-0011, Japan. Tel: +81-42-561-0771, Fax: +81-42-561-4729, E-mail: hshimizu@nih.go.jp

This article appeared in the Infectious Agents Surveil-

Table 1. Characterization of poliovirus isolates from a suspected VAPP case in Hokkaido in 2007

Virus	Date of sampling	Sample	Serotype	VP1 sequence[1)]	Final result
#130/stool-1	Dec. 12, 2007[2)]	Stool	Type 2	99.8% identity to Sabin 2	Sabin 2
			Type 3	99.7% identity to Sabin 3	Sabin 3
#130/stool-5	Dec. 15, 2007[3)]	Stool	Type 2	99.8% identity to Sabin 2	Sabin 2
			Type 3	99.6% identity to Sabin 3	Sabin 3

1): Nucleotide identity from the original Sabin strain in the entire VP1 region.
2): Six days after the onset of paralysis.
3): Nine days after the onset of paralysis.

lance Report (IASR), vol. 29, p. 200–201, 2008 in Japanese.

We are grateful to the staff members of the regional hospital for the information and comments on preparing this article.

REFERENCES

1. World Health Organization (2004): Polio Laboratory. 4th ed. WHO/IVB/04.10. World Health Organization, Geneva, Switzerland.
2. Kew, O.M., Sutter, R.W., de Gourville, E.M., et al. (2005): Vaccine-derived polioviruses and the endgame strategy for global polio eradication. Annu. Rev. Microbiol., 59, 587–635.
3. Nix, W.A., Oberste, M.S. and Pallansch, M.A. (2006): Sensitive, seminested PCR amplification of VP1 sequences for direct identification of all enterovirus serotypes from original clinical specimens. J. Clin. Microbiol., 44, 2698–2704.
4. Shimizu, H., Yoshida, H., Utama, A., et al. (2003): Surveillance of poliovirus-isolates in Japan, 2002. Jpn. J. Infect. Dis., 56, 218–219.
5. Okuda, B., Uetani, E. and Okamoto, K. (2006): Vaccine-associated paralytic poliomyelitis caused by contact infection. Intern. Med., 45, 373–375.
6. Tuberculosis and Infectious Disease Control Division, Ministry of Health, Labour and Welfare and Infectious Disease Surveillance Center, National Institute of Infectious Diseases (2008): Annual Report 2006. National Epidemiological Surveillance of Vaccine-Preventable Diseases. Online at <http://idsc.nih.go.jp/yosoku/Annual-J/2006/06menu.html> (in Japanese).
7. Hao, L., Toyokawa, S. and Kobayashi, Y. (2008): Poisson-model analysis of the risk of vaccine-associated paralytic poliomyelitis in Japan between 1971 and 2000. Jpn. J. Infect. Dis., 61, 100–103.
8. The Subcommittee on Polio and Measles Vaccination (2003): Recommendation for polio and measles vaccination in the future in Japan. Online at <http://www.mhlw.go.jp/shingi/2003/03/s0328-2.html> (in Japanese).
9. Bonnet M.C. and Dutta, A. (2008): World wide experience with inactivated poliovirus vaccine. Vaccine, 26, 4978–4983.
10. World Health Organization (2005): Cessation of Routine Oral Polio Vaccine (OPV) Use after Global Polio Eradication-Framework for National Policy Makers in OPV-Using Countries. p. 1–10.