



## BRIEF REPORT

# National Action Plan for Response to Poliovirus Importation

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### Abstract

The Division of Vaccine-Preventable Disease Control and National Immunization Program of the Korea Centers for Disease Control and Prevention has prepared a plan of action as a guide for key actions that will be taken if a poliovirus outbreak occurs in the Republic of Korea. The history of poliomyelitis and vaccination against poliovirus in the nation was reviewed and the routine surveillance procedures that are currently in place were described. The principles and specific actions for an effective response to a poliovirus outbreak were prepared. The guidelines clearly outline the actions to be taken in case of a polio outbreak. When a suspected case of poliovirus infection is reported, an immediate epidemiological investigation is to be conducted. The response to a poliovirus outbreak includes case isolation, management of potential contacts and immunization. All stakeholders are to be made aware of what key actions should be taken at each stage of the response to a poliovirus outbreak in the nation.

## 1. Introduction

### 1.1. History of poliomyelitis and vaccination against poliovirus

The first case of poliomyelitis in Korea was reported in 1939. The inactivated polio vaccine (IPV) and the oral polio vaccine (OPV) were introduced in 1958 and 1962 respectively, and the National Immunization Program

(NIP), which was established in 1966, designated poliomyelitis as a second-class communicable disease. Until 1975 most vaccinations used both IPV and OPV, thereafter only OPV was used.

The overall risk for vaccine-associated paralytic poliomyelitis is estimated to be approximately one per 2.4 million doses of OPV vaccine [1]. One vaccine-associated paralytic poliomyelitis case was reported in Korea

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**Table 1.** Number of reported cases of poliomyelitis in Korea

Year	1960–65	1966–70	1971–75	1976–80	1981–83	1984–2010
Cases	6541	1088	337	137	9	0

in 2003 [2]. In 2004, the Korea Advisory Committee on Immunization Practices (KACIP) recommended the use of an IPV-only schedule in the NIP, and since then only IPV has been used in Korea.

Polio vaccination is recommended at 2, 4 and 6 months of age with a booster dose at 4–6 years. The immunization rate for polio has been sustained at an estimated level of 90–95% since the 1980s.

## 1.2. Reported cases of poliomyelitis in Korea

According to a study conducted during 1962–1964, poliomyelitis cases were most prevalent in one-year-olds, and 70% of the cases were in children below 3 years of age [3]. After polio vaccine was introduced in the 1960s, the incidence of poliomyelitis declined to 0.1/100,000 persons and the mortality rate decreased to 0.1–0.4% [4]. After the five reported cases in 1983, no case of wild poliovirus infection has been reported in Korea up to 2010 (Table 1) [5].

## 1.3. National infectious disease surveillance and laboratory surveillance systems

All notifiable vaccine-preventable diseases (VPD) are reported from public health centers, private clinics and hospitals to the Korea Centers for Disease Control and Prevention (KCDC) via a web-based system under the Prevention of Communicable Disease Act. The system is known as the Korea National Infectious Disease Surveillance (NIDS) system.

NIDS is coupled with a laboratory surveillance system. Apart from reporting VPD cases to NIDS, for

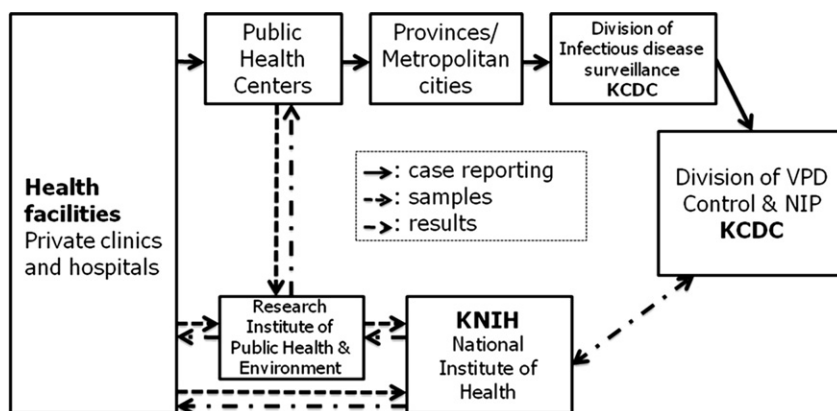
confirmatory testing public health centers, private clinics and hospitals can send various samples from patients suspected of having infectious diseases directly to the Korea National Institute of Health (KNIH) or indirectly through a provincial Research Institute of Public Health and Environment to the KNIH. The results of these tests are reported to the KCDC. A schematic flow chart of the NIDS and laboratory surveillance systems is shown in the Figure.

## 1.4. Surveillance of acute flaccid paralysis

An annual non-polio rate of acute flaccid paralysis (AFP) of  $\geq 1/100,000$  in children under 15 years of age is a requirement for certifying polio eradication in a country [6]. Since 1998, AFP surveillance in Korea has been conducted every year with 70 reporting hospitals under the coordination of the KNIH [7]. As of 2011, 50 sentinel hospitals, including all the pediatrician-training hospitals, are under surveillance.

## 1.5. Laboratory confirmation of poliomyelitis

Virologic evaluation to confirm poliomyelitis consists of tests on two adequate stool specimens from each AFP patient collected 24–48 hours apart and within 14 days of onset of paralysis [8,9]. Laboratory confirmation of poliomyelitis is performed using a cell culture/neutralization test. The stool is further tested using real time reverse transcription polymerase chain reaction (RT-PCR) using pan-enterovirus [9], group-specific [10] and serotype-specific primer sets [11].



**Figure.** National Infectious Disease Surveillance and laboratory surveillance systems Health facilities report notifiable diseases to the Korea Centers for Disease Control and Prevention (KCDC) through public health centers in provinces/metropolitan cities. For confirmatory testing, samples taken from patients are sent directly to the Korea National Institute of Health (KNIH) or indirectly through the Research Institute of Public Health and Environment. The test results and information on reported cases are shared between the KCDC and the KNIH. VPD = vaccine-preventable disease; NIP = National Immunization Program.

## 2. Response Plan Against Poliomyelitis Outbreak

In 2010, in response to the increased possibility of poliovirus importation because of a recent poliovirus outbreak in the European region, the Division of VPD Control and NIP of the KCDC prepared a response plan as a guide for key actions to be taken if a poliovirus outbreak occurs in the Republic of Korea.

### 2.1. Principles

- Because the Republic of Korea maintains a high immunization rate and has generally good sanitation, a poliomyelitis outbreak is unlikely to occur in the country.
- However, a single detected case of poliovirus infection would be considered as an outbreak and would initiate activation of the response plan.
- All decisions on the response to poliovirus detection will be made at the national level.
- Regular, timely and comprehensive information sharing with the public, relevant partners and international society is important.

### 2.2. Action plan

Each action is not necessarily separate from other actions; rather it is more likely that a number of actions will take place simultaneously. Response teams will be required at all levels of the public health system. The primary response will be driven at the jurisdiction level and coordination at the national level will be overseen by the KCDC.

#### 2.2.1. Reporting suspected case

Any poliovirus isolated from a reported AFP case or any suspected poliovirus infection case reported through the NIDS will signal the immediate initiation of the actions described below.

#### 2.2.2. Case investigation

Within 24 hours of a case being reported an epidemiological investigation will be initiated and, for virologic evaluation, stool specimens from every case will be sent to the national polio laboratory for testing. Epidemiological investigation will determine the likely source of the infection and indicate if the virus might have spread further. It will be essential to collect as much information as possible about the patient's history including:

- Information about the patient, e.g. age and sex.
- Clinical course and laboratory testing.
- Immunization status of the patient.
- Exposure history (1): residence in or travel to a polio endemic country or to a country that has

recently reported transmission of poliovirus or vaccine-derived poliovirus.

- Exposure history (2): contact with persons recently immunized with OPV, or with persons who have recently traveled to a polio endemic country or contact with persons who have traveled to a country that has recently reported importation of polio cases or vaccine-derived poliovirus or that uses OPV.

For an example of the Suspected polio case worksheet see [Table 2](#).

#### 2.2.3. Expert meetings

When the case investigation is complete, the KCDC will convene an urgent meeting of the KACIP sub-committee for DTaP/polio vaccines to inform the advisory group of a possible polio outbreak. The sub-committee will review the results of the case investigation and check that all the necessary information has been obtained. The sub-committee will then decide what further information should be obtained and provide technical advice on what actions should be taken in response to the outbreak. When appropriate, the results of the meeting will be presented to KACIP members.

Because a polio outbreak is a public health emergency of international concern under the International Health Regulations (IHR), the IHR Focal Point of Korea will immediately notify the World Health Organization of the situation.

#### 2.2.4. Outbreak response

The poliovirus outbreak response includes:

- Case isolation
- Management of potential contacts
- Immunization
- Cleaning and disinfecting
- Enhanced surveillance
- Risk communication

##### 2.2.4.1. Case isolation

Individuals identified as or suspected of being infected with poliovirus will be isolated to reduce the risk of virus spread. The patient will be isolated from other patients in hospitals. Weekly stool specimens will be collected from the patient and tested in the national polio laboratory. Isolation can be terminated when two consecutive weekly stool samples are negative for poliovirus.

Since poliovirus transmission is mainly person-to-person via the fecal-oral route, health care workers or other caregivers should follow contact precautions.

##### 2.2.4.2. Management of potential contacts

To contain the spread of the virus, the relevant jurisdiction under the supervision of the higher-level organization will identify potential contacts of a patient and undertake appropriate measures. Potential contacts would

Table 2. Suspected polio case worksheet

Suspected Polio Case Worksheet									
Korea Centers for Disease Control and Prevention									
Health center		Investigator		Date		Phone ( ) -			
Reporting site		Reporting doctor		City/Region		Phone ( ) -			
Patient Information									
Name		Sex	M <input type="checkbox"/> F <input type="checkbox"/>	Birth date	yr mo d	Age		yr/mo	
Social security number		-		Korean <input type="checkbox"/> Foreigner <input type="checkbox"/> (Nationality: / Ethnicity: )		Current Status		Alive <input type="checkbox"/> Dead <input type="checkbox"/>	
Name of guardian		Address				Phone		( ) -	
Affiliation		School <input type="checkbox"/> Kindergarten <input type="checkbox"/> Office <input type="checkbox"/> Others <input type="checkbox"/> ( ) None <input type="checkbox"/>		Affiliation		Affiliation contact		( ) -	
Clinical Course									
Date of onset		Date of 60-day F/U		Site of paralysis	Spinal <input type="checkbox"/> Bulbar <input type="checkbox"/> Spino-bulbar <input type="checkbox"/>	60-day residual		None <input type="checkbox"/> Minor <input type="checkbox"/> =<2 extremities <input type="checkbox"/> >3 extremities <input type="checkbox"/> Death <input type="checkbox"/> Unknown <input type="checkbox"/>	
CSF results		WBC ( )	RBC ( )	Lymph ( %)	RBC ( %)	Protein ( )	Glucose ( )		
Admission to hospital		Yes <input type="checkbox"/> (Name: /Location: /Duration: ) No <input type="checkbox"/>				Findings of other studies			
Laboratory Information									
Date obtained		Specimen type	Serum <input type="checkbox"/> Stool <input type="checkbox"/> CSF <input type="checkbox"/> Others <input type="checkbox"/>	Site of sample obtained	Private <input type="checkbox"/> Public <input type="checkbox"/>	Site of sample tested	Private <input type="checkbox"/> Regional Health Center <input type="checkbox"/> Korea CDC <input type="checkbox"/>		
Date tested		Tests: IgM <input type="checkbox"/> PCR <input type="checkbox"/> Virus isolation <input type="checkbox"/> (Virus type: )							
Specific tests: EMG <input type="checkbox"/> (Result ) NCS <input type="checkbox"/> (Result ) Immunologic studies <input type="checkbox"/> (Result )									
Immunization History									
IPV <input type="checkbox"/> OPV <input type="checkbox"/> 1st Dose	Done <input type="checkbox"/> None <input type="checkbox"/> Unknown <input type="checkbox"/>	Date :		IPV <input type="checkbox"/> OPV <input type="checkbox"/> 2nd dose	Done <input type="checkbox"/> None <input type="checkbox"/> Unknown <input type="checkbox"/>	Date :			
		Site: Private <input type="checkbox"/> Public <input type="checkbox"/>				Site: Private <input type="checkbox"/> Public <input type="checkbox"/>			
All polio immunization history following the 2 <sup>nd</sup> dose should be recorded:									
Immunization record	Immunization registry <input type="checkbox"/> Immunization card <input type="checkbox"/> Recall <input type="checkbox"/> Others <input type="checkbox"/> ( )								
Exposure History									
Case/family travel to endemic/epidemic area			Was case/family exposed to persons from or returning to endemic/epidemic area?			Did case have contact with OPV recipient?			
Yes <input type="checkbox"/> No <input type="checkbox"/>			Yes <input type="checkbox"/> No <input type="checkbox"/>			Yes <input type="checkbox"/> No <input type="checkbox"/>			
Location of exposure			Location of exposure			Date of contact with recipient			
Date of departure			Date of departure			Nationality of contact			
Date of return			Date of return			Age of contact			

be: 1) household contacts who lived with the patient and shared a toilet during the infectious period; 2) health care workers who cared for the patient during the infectious period; and 3) public contacts including toilet contacts who contacted or shared a toilet with the patient before the patient was isolated and the toilet was cleaned.

- Household contacts have the greatest risk of being exposed to poliovirus and should be isolated at home until it is proved that they are not infected. Stool specimens should be taken at least 3 days

after first exposure to the index patient. Contacts can be released from quarantine when two stool samples taken 24–48 hours apart are negative for poliovirus.

- For health care workers who have been in close contact with the index patient and who have no recorded immunization history, or who are not yet completely vaccinated, two stool samples should be taken 24–48 hours apart, the first being taken at least 3 days after first exposure to the index patient.

**Table 3.** Contact tracing worksheet

- Contacts can be classified as household contacts, healthcare workers, or public contacts.

■ **Name of the patient:**

■ **Reporting unit:**

■ **Reporting person:**

■ **Contact of reporting unit and person:**

Name	Age	Affiliation	Relationship to patient	Symptom	Onset of symptom	Immunization record	Remarks
		Name: Contact:				1 <sup>st</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:	
			2 <sup>nd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			3 <sup>rd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			4 <sup>th</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
		Name: Contact:				1 <sup>st</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:	
			2 <sup>nd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			3 <sup>rd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			4 <sup>th</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
		Name: Contact:				1 <sup>st</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:	
			2 <sup>nd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			3 <sup>rd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			4 <sup>th</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
		Name: Contact:				1 <sup>st</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:	
			2 <sup>nd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			3 <sup>rd</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				
			4 <sup>th</sup> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown <input type="checkbox"/> Date:				

- Public contacts will be provided with information on poliovirus infection, hygiene and vaccination. They will be informed that they might have been in contact with poliovirus and advised that they should immediately consult a public health center if they develop any symptom that could be attributed to poliovirus infection.

For an example of the Contact tracing worksheet see [Table 3](#).

#### 2.2.4.3. Immunization

IPV is the only polio vaccine available in Korea, and so IPV will be used in response to an outbreak. All index patient contacts should check their immunization

records and update immunization as recommended. Among the contacts, all children and adolescents should be immunized with IPV according to their age. If the vaccination status of a contact is unknown or incomplete, they will be offered a primary series of IPV.

Because there is no concrete evidence on the post-prophylaxis effect of the poliovirus vaccine, all those vaccinated will be informed that they are not necessarily protected and that they should still consult a public health center if they develop any symptom.

#### 2.2.4.4. *Cleaning and disinfection*

Proper cleaning and disinfecting of areas used by an infected individual is required to prevent onward transmission. Cleaning and disinfecting of every object that might harbor infectious material, including toilets used by the patient during the infectious period, should be diligently carried out. During the isolation of the patient, the stool should be managed properly until it tests negative for poliovirus.

#### 2.2.4.5. *Enhanced surveillance*

If a poliovirus outbreak is identified, all virology laboratories in the jurisdiction will be alerted. All clinicians will be immediately informed through various channels, including but not limited to letters or fax, that they are required to participate in the intensified surveillance for AFP. All clinicians should actively encourage children and adolescents to keep up their immunization. Enhanced surveillance should be maintained for a period of at least 6 months after the last case is detected.

#### 2.2.4.6. *Risk communication*

Risk communication would include establishing public confidence, providing clear information and rapid and up-to-date announcements to the public. Gaining public confidence is necessary to avoid social disorder and to encourage desirable behaviors, such as immunization and the reporting of any suspicious case.

For a sample notification letter see [Table 4](#).

#### 2.2.5. Lessons learned and revision of the plan

At least six months after the last case of poliovirus infection, documentation of the interruption of transmission of poliovirus will be prepared. Detailed and comprehensive documentation describing the epidemiological background, the findings of the case investigations laboratory results, the response to immunization and the results of enhanced surveillance is required.

While this documentation is being prepared, all activities in response to the poliovirus outbreak will be reviewed and the reasons why the poliovirus outbreak occurred in the first place will be investigated. All lessons learned will be reflected in a revised national

**Table 4.** Sample notification letter to the public and potential contacts

This letter is to notify you that a suspected/confirmed case of poliomyelitis is reported at OOO region and that you or your child may have been exposed.

Poliomyelitis, known as polio, is a highly infectious disease caused by a virus named poliovirus that invades the nervous system. The disease usually affects children. Approximately 95% of persons infected with polio will have no symptoms and 4–8% of infected persons have minor symptoms, such as fever, fatigue, and flu-like symptoms. Less than 1% of polio infections result in permanent paralysis of the limbs. Of those paralyzed, 5–10% die when the respiratory muscles are affected.

Polio is spread by person-to-person contact. After the report of five cases in 1983 and until recently, because of improved hygiene and vigorous immunization, no wild poliovirus infection has been reported in Korea.

However, a suspected/confirmed case of poliomyelitis was reported at (where) on (when).

We strongly urge you to check your child's polio immunization record. In Korea, polio vaccination is recommended at 2, 4 and 6 months of age, with a booster dose at 4–6 years. All children and adolescents should be immunized with polio vaccine according to their age. If you have any questions regarding immunization, please contact OOO public health center at OOO-OOO-OOOO.

If you or your child develops any of the polio-like symptoms described above, you and your child should avoid further contact and immediately notify OOO public health center(Tel: OOO-OOO-OOOO).

We are closely working with the Korea Centers for Disease Control and Prevention to respond quickly and effectively to this possible polio outbreak. We will notify you if any other information becomes available. Thank you for your cooperation.

Department of Health  
OOO Metropolitan city/Province

action plan and in improvements in the existing AFP surveillance system.

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