



衛生防護中心  
Centre for Health Protection

## Scientific Committee on Enteric Infections and Foodborne Diseases

### Epidemiology, Prevention and Control of Cholera in Hong Kong

#### Purpose

Cholera remains a public health threat affecting vulnerable populations living with unreliable water supply and sub-standard sanitary conditions. Every year, there are an estimated 3 - 5 million cholera cases and 100,000 - 120,000 associated deaths worldwide (1). This paper aims to review the global and local epidemiology of cholera and examine the current prevention and control measures in Hong Kong.

#### The pathogen and the disease

##### The bacteria

2. Cholera is an acute intestinal infection caused by the bacterium *Vibrio cholerae*. It is a gram-negative, rod-shaped waterborne bacterium that carries a single polar flagellum. It grows rapidly in optimum temperature at 37°C, with a range of 10 to 43°C. The organism can be inactivated at pH values less than 4.5 at room temperature and it grows in optimum pH of 7.6, with a range of 5.0 to 9.6 (2). The pathogenesis of *V. cholerae* involves both the colonisation of the intestine and the production of cholera toxin (CT) which acts locally to stimulate excessive electrolyte and fluid secretion, primarily from the crypt cells of the small intestine (3).

3. Strains of *V. cholerae* are characterised by serogrouping based on the polysaccharides of the somatic O antigen. More than 200 serogroups of *V. cholerae* are reported but only 2 serogroups, O1 and O139, cause epidemic cholera and pose serious health threats (4). No proven cross-protection of these two serogroups has been found (5). Within the O1 and O139 serogroups, the ability to produce CT is a major determinant of virulence. In general, toxigenic serogroups O1



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and O139 of *V. cholerae* are considered fully virulent and capable of causing cholera epidemics or pandemics. Nontoxigenic (NT) strains within these serogroups also exist in the environment, and some may cause sporadic cases of cholera-like disease. Although the pathogenic mechanism by which NT *V. cholerae* O1 strains induce diarrhoea in humans is unclear, an increasing number of these NT *V. cholerae* O1 strains have been reported to be associated with clusters of diarrhoea disease in a number of countries such as India, Mexico, Brazil and Argentina, causing mild to severe cholera-like diarrhoea (6-9).

4. Serogroup O1 consists of 2 biotypes, namely El Tor and classical. Both of these biotypes could be further classified into 3 serotypes (Ogawa, Inaba and rarely Hikojima). Compared with the classical strains, El Tor strains persist longer in the environment, and are more likely to cause asymptomatic infections and shed in excreta for a longer period of time. The classical strains are thought to be responsible for the first six cholera pandemics, while the El Tor biotype has become predominant in the seventh pandemic which started its course in 1961 to present (4).

#### Disease transmission and clinical presentation

5. Cholera is transmitted by the faecal-oral route, usually after ingestion of food or water that has been contaminated with infected faeces. Other common vehicles of infection include contaminated fish and shellfish, produce, or leftover cooked grains that have not been reheated properly (10). Direct person-to-person transmission of cholera is rare, as a high infectious dose of  $10^8$  bacteria is necessary to cause the disease in healthy individuals, but a much lower dose ( $10^5$ ) is sufficient in individuals with low levels of gastric acid (11-13).

6. Since untreated stools from cholera patients are the primary source of environmental contamination, proper treatment and safe disposal of liquid waste, including patient's excreta and vomit, should be undertaken to prevent contamination and secondary spread of infection. Hand hygiene should be observed at all times, especially after any contact with excreta and before preparing or eating food (14).

7. Symptoms of cholera are characterised by acute onset of profuse watery diarrhoea (described as "rice-water" stools) and often vomiting. The incubation period is short that usually lasts from two hours to five days and therefore the number of cases can rise very quickly with explosive pattern of outbreaks (15). In severe cases, continuous fluid loss may quickly lead to extreme dehydration and shock that could be fatal, and the mortality can reach up to 50% (12). Among the people with symptoms, 80% have mild illness and around 20% develop acute watery diarrhoea with severe dehydration. About two-third of the cholera patients do not develop any symptoms, the bacteria are

present in their faeces for 7–14 days after infection and shed back into the environment that may potentially pass the infection to others (1). Chronic carriers are not common, and do not play a significant role in cholera persistence. Asymptomatic infection usually takes place when symptomatic cholera is occurring, and is probably more important in intra-familial transmission as secondary spread (16). People with gastric hypochlorhydria or achlorhydria, or with low immunity such as renal failure, malnourished children or people living with HIV are at a greater risk of infection (11, 13).

8. Prompt replacement of fluid lost is the mainstay of treatment of cholera. For mild or moderate dehydration, fluid replacement can be achieved by oral rehydration solutions. However, very severely dehydrated patients with stupor, coma, uncontrollable vomiting, or extreme fatigue that prevents drinking should be rehydrated intravenously (15). Appropriate antibiotics such as tetracycline, ciprofloxacin, doxycycline and co-trimoxazole may also be administered to moderate or severe cases to diminish the duration of diarrhoea so as to shorten the duration of *V. cholerae* excretion and reduce the volume of rehydration fluids needed (17). However, mass administration of antibiotics is not recommended by the World Health Organization (WHO) due to an increasing risk of antimicrobial resistance. In fact, multi-drug resistant strains of El Tor biotype were documented from an outbreak in Bangladesh in 1979 in which 36% of the strains were resistant to tetracycline, ampicillin, kanamycine, streptomycin, and trimethoprim sulfamethoxazole (18). For children up to five years, supplementary administration of zinc has a proven effective in reducing duration of diarrhoea as well as reduction in successive diarrhoea episodes (15).

### Laboratory diagnosis

9. Cholera can be confirmed by culture of stool or rectal swab specimen, followed by serological testing with O1 or O139 antisera. Further characterisation of serotype can be performed using antisera to serotypes Inaba and Ogawa. No serotypes have been identified in the O139 serogroup (19). Biotyping of *V. cholerae* O1 can also be undertaken to differentiate the classical and El Tor biovars.

10. Commercially available rapid diagnostic test kits are convenient for use in epidemic settings, however, they do not yield an isolate for antimicrobial susceptibility testing and subtyping and should not be used for routine diagnosis. The WHO suggests that samples tested positive with rapid tests should be re-tested using classic laboratory procedures for confirmation (15).

## Global epidemiology

### Cholera pandemics

11. Cholera first emerged from the Ganges Delta of the Indian sub-continent as early as the nineteenth century, and later swept the world in the form of seven pandemics since 1817. The current seventh pandemic was caused by the El Tor biotype of *V. cholerae* serogroup O1 which began in Indonesia in 1961, and subsequently spread to Africa and the Americas in 1970 and 1991 respectively (20). Today, *V. cholerae* O1 primarily accounts for the majority of cholera outbreaks worldwide, and remains endemic in much of Africa and Asia (16).

12. In 1992, a novel serotype O139 emerged in India, and spread rapidly into Bangladesh and neighbouring countries in Asia. The strain was classified as O139 Bengal and was later shown to be a genetic derivative of the seventh pandemic O1 strains clone with its replacement of the O antigen (16). So far, the spread of *V. cholerae* O139 Bengal is still restricted to Asia (4). Recently, the emergence of El Tor variants, which have the ability to produce classical cholera toxin, appear to be more virulent and cause more severe illness than the original El Tor strains. These variant strains that previously caused outbreaks in Bangladesh and India are now predominant in parts of Africa and South and Southeast Asia. Concurrently, the emergence and spread of antibiotic resistant strain were also found in these highly-endemic countries (4, 12, 21-23).

### Current situation

13. For the past decade, cholera has been largely confined to developing countries in the tropics and subtropics, especially in parts of Asia, Africa, and South and Central America where clean water and sanitation measures are lacking. The global incidence of cholera has been on steady increase in recent years. In 2009, a total of 45 countries reported 221,226 cases to the WHO, an increase by 16% compared with 190,130 cases in 2008. Yet there was a slight decline in the overall case fatality rate from 2.7% (5143 deaths) in 2008 to 2.24% (4,946 deaths) in 2009 (24, 25). Africa alone accounted for 98% of the cholera cases (217,333 cases) and 99% of the deaths worldwide (4883 cases), while 1902 (0.86%) cases were reported from Asia. Of the 55 outbreaks of acute diarrhoea disease verified by WHO, 47 were confirmed as cholera outbreaks in 29 countries, of which 38 (80.8%) occurred in Africa and 9 (19.1%) in Asia (Figure 1) (25). In recent years, massive and prolonged outbreaks have occurred in countries that have been free of cholera for decades. One of the large outbreaks took place in Zimbabwe resulting in 98,592 cases including 4288 deaths between August 2008 and July 2009. More recently, an outbreak of cholera broke out in Haiti following an earthquake that struck in early January 2010. As of June 4, 2011, the outbreak has resulted in

over 331,454 cumulative cholera cases and 5386 deaths. The epidemic has been put under control after intensive public health interventions by the WHO and various health organisations (26).

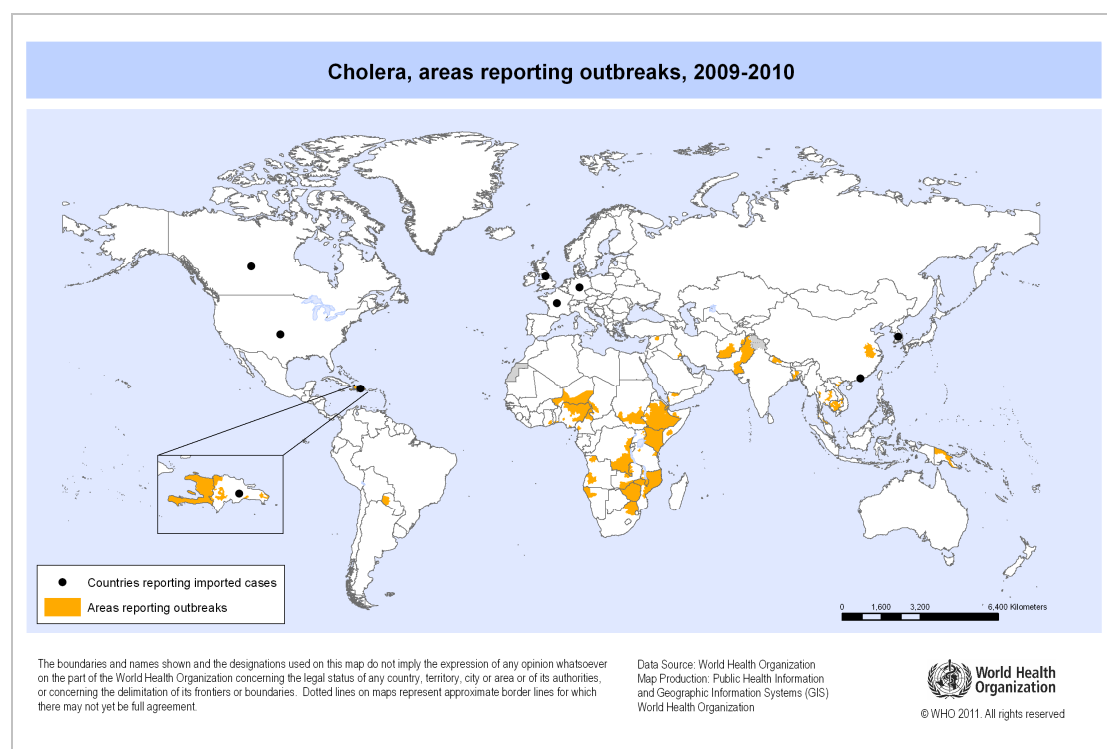


Figure 1. Areas reporting cholera outbreaks to World Health Organization, 2009-2010 (Map reproduced with permission from the World Health Organization).

### WHO global surveillance of cholera

14. Cholera was initially one of the three reportable diseases under the International Health Regulations (IHR) since 1969. As the IHR (2005) implemented in June 2007, case-base surveillance on cholera is no longer mandatory but the Regulations require reporting of outbreaks that have public health impact, are unusual or unexpected, or which post a threat of international spread or trade or travel restrictions to WHO (27). The WHO has launched a Global Task Force on Cholera Control in 1992 as an international partnership to provide technical advice and support for cholera control and prevention at country level; training of health professionals at national, regional and global levels in prevention, preparedness and response of diarrhoeal disease outbreaks; and the dissemination of information on cholera and other epidemic prone enteric diseases to health professionals and the general public. Countries are encouraged to report cholera cases in their territory to the WHO if they meet the WHO standard case definition<sup>1</sup>. The notification of these cases is being

<sup>1</sup> WHO standard case definition for cholera

<sup>1</sup> WHO Standard case definition: A case of cholera should be suspected when:

- in an area where the disease is not known to be present, a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhoea;
- in an area where there is a cholera epidemic, a patient aged 5 years or more develops acute watery diarrhoea, with or without vomiting.

A case of cholera is confirmed when *Vibrio cholerae* O1 or O139 is isolated from any patient with diarrhoea.

published in the Weekly Epidemiological Record on a yearly basis. However, the figures do not include cases labeled as acute watery diarrhoea in several countries in Africa, central and south-east Asia which together account for >500,000 cases annually. More importantly, these official figures represent only 5 to 10% of actual cases worldwide because of under-reporting and limitations in surveillance systems in some countries, which may likely underestimate the true disease burden and changing epidemiological patterns (25).

## Local situation

### Cholera in the early years

15. Data on cholera has been available since 1946 when 514 cholera cases with 246 deaths were reported in Hong Kong (Figure 2). Since then, Hong Kong had been free of cholera for almost 15 years until its later recurrence in early 1960s. At that time, cholera cases were commonly seen among the older and younger populations of lower socio-economic status living in overcrowded setting with poor sanitation (28). Large cholera outbreak associated with extracted water from contaminated wells had occurred during the severe water shortage in 1963 and 1964. Later in 1989, a cholera outbreak broke out among 21 Vietnamese refugees interned in a temporary camp at Tai Ah Chau (29).

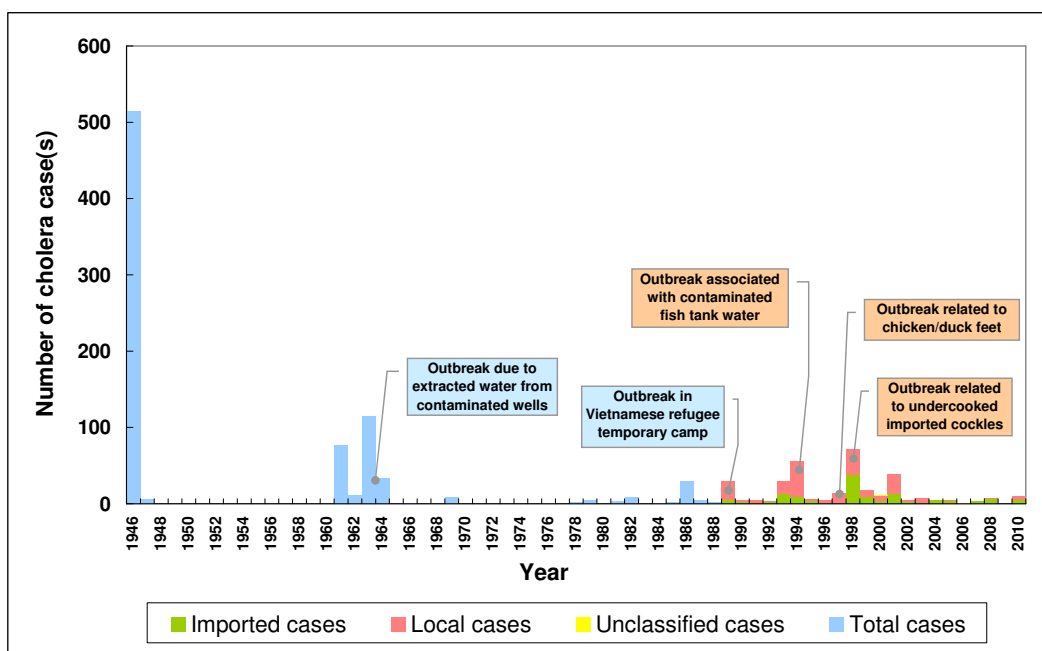


Figure 2. Cholera in Hong Kong, 1946-2010.

16. Sporadic cases of cholera continued to be reported with occasional outbreaks in the following years, mostly related to consumption of inadequately cooked or contaminated seafood. In 1994, *V. cholerae* O1 El Tor Inaba have been isolated in the fish tank water used for keeping live seafood in a local outbreak of 12 cases after consumption of the seafood (30). Thereafter, in 1997 and 1998, 13 and 7 local cholera cases were reported after consumption of chicken/duck feet processed in untreated well water and undercooked imported cockles, respectively (31, 32). Beyond that, clusters of imported cholera cases have also been found among tour group members returning from neighbouring areas such as Thailand (29 cases in 1998), the Philippines (11 cases in 2001), and Mainland China (7 cases in 1998), with history of sharing common meals of various kinds of seafood during their trips (33, 34).

### Recent epidemiology

17. With the advances in sanitation systems and food handling practices, coupled with heightened awareness of personal hygiene, cholera incidence has been markedly reduced in the recent decade. A review of cholera cases notified to the Department of Health (DH) between January 2001 and December 2010 was conducted to delineate the recent epidemiology. Cases are defined as persons with compatible clinical features together with laboratory confirmation of *V. cholerae* serogroups O1 or O139 from stool specimen or rectal swab by the Public Health Laboratory Services Branch (PHLSB) of Centre for Health Protection (CHP) or microbiology laboratory of public hospitals. Over the 10-year period under review, a total of 79 cases were recorded, with the annual number ranging from 0 in 2009 to 38 in 2001. A seasonal pattern was observed, with higher numbers occurred in the summer months (from June to September) than in the winter months (Figure 3). The majority of cholera cases appeared sporadically with some clustering of cases involving a common food source or a common vehicle of infection.

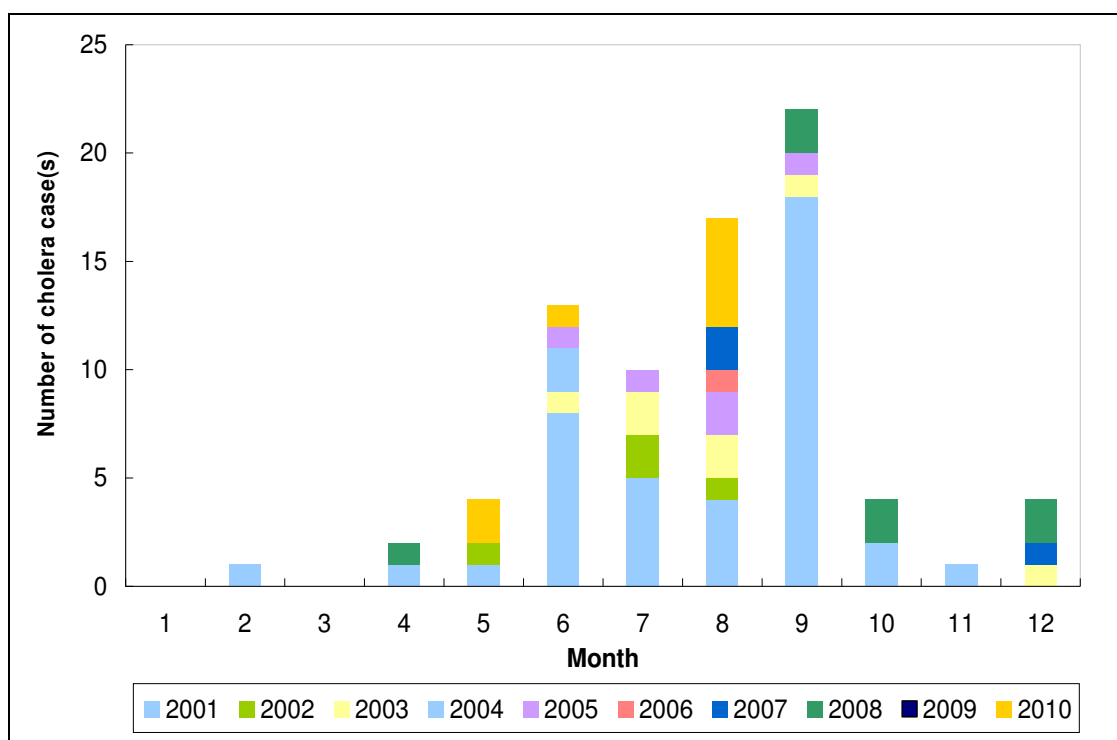


Figure 3. Cholera cases by month of notification, 2001-2010.

18. Forty cases (50.6%) were locally acquired, 38 (49.1%) were imported, and 1 (1.3%) was unclassified due to trans-boundary movement during the incubation period. Most of the imported cases were from the Philippines (36.8%), India (21.1%), Indonesia (13.2%), Mainland China (7.9%) and other countries such as Pakistan (7.9%), Nepal (5.3%), Thailand (5.3%), and Singapore (2.6%). Cases were quite evenly distributed between the two sexes, with a male-to-female ratio of 1:1.5. Adults had a higher incidence than children in general. The age of the patients ranged between 8 months and 91 years, with a median of 38 years and those aged 25 to 34 had a higher incidence across all age groups (Table 1).

Table 1. Age distribution of cholera cases, 2001-2010.

Age group	0-14	15-24	25-34	35-44	45-54	55-64	>=65
No. of cases	8	10	19	13	11	8	10
(Percentage)	(10.1%)	(12.7%)	(24.1%)	(16.5%)	(13.9%)	(10.1%)	(12.7%)

19. Most of the reported cases were mild or moderate. All the patients were admitted to hospital for medical treatment. Most presented with watery diarrhoea (89%), vomiting (37%), abdominal pain (29%) and fever (9%). They did not have complications and no fatal cases were recorded over the past ten years.

20. *Vibrio cholerae* El Tor Ogawa and El Tor Inaba accounted for 54.4% and 41.8% of the cases respectively. Two patients (2.5%) who had travelled to the Philippines had mixed infections of both serotypes (Inaba and Ogawa), while one case was caused by *V. cholerae* O139. Most (81.6%) of the

serotypes isolated in imported cases belonged to Ogawa, while 5 (13.2%) were Inaba strains. On the other hand, most of the local cholera cases (70%) were caused by *V. cholerae* O1 El Tor Inaba, while 11 cases (27.5%) were El Tor Ogawa and 1 (2.5%) due to the O139 serogroup.

21. Among the 20 cholera cases confirmed during 2006-2010, 12 were toxin-producing *V. cholerae* O1 of which 10 were imported cases from neighbouring countries. One unclassified case and only one local case reported during this period were confirmed as containing toxigenic *V. cholerae* O1. Two of the local nontoxigenic *V. cholerae* O1 cases were epidemiologically linked, with history of sharing common meals in different restaurants. So far, the majority of the strains were sensitive to common first-line drugs used for treating cholera such as tetracycline (73.2%) and ampicillin (66.1%).

22. *V. cholerae* grow and survive naturally in the aquatic environment, especially in brackish waters and estuarine systems. Consumption of contaminated seafood by *V. cholerae* has been implicated in many cholera outbreaks worldwide (35). In our review, the suspected food item was identified in about half of the cholera cases with detailed food histories available, of which, seafood (including fish, shellfish, squid, raw oysters, etc.) accounted for about 74%. Other food items consumed by the cases included vegetables and fruits, meat, cereals and dairy products such as cheese, milk. The food samples and environmental swabs collected from patients' residence or related food premises/stalls were also found negative for *V. cholerae*. The exact source of infection of most of these cases could not be ascertained despite intensive epidemiological and environmental investigations.

## **Prevention and Control for Cholera in Hong Kong**

### **Disease surveillance and public health response**

23. Cholera is currently a statutory notifiable disease under the Prevention and Control of Disease Ordinance (Cap. 599). Registered medical practitioners are required by law to notify any suspected or confirmed cholera cases to the DH for immediate investigation and disease control. Upon receipt of notification of a suspected/confirmed cholera case, CHP will carry out prompt intensive epidemiological investigation and control measures including source finding and contact tracing. The patient should be isolated in the hospital for proper medical care, and detailed travel and food histories would be taken. The CHP will investigate on all household contacts that shared food and sanitary facilities with the patient during the incubation period. Food and travel collaterals will also be interviewed for any gastrointestinal symptoms. They will be put under medical surveillance and rectal swab and/or stool specimens would be taken. Chemoprophylaxis is usually not required unless there is evidence suggesting high risk of secondary transmission. In addition, environmental, water and food samples would also be collected for laboratory

testing for *V. cholerae* to determine the source of infection.

24. CHP will also collaborate with the FEHD to visit the patient's residence and FEHD will conduct field investigations to the suspected food premises/stalls. Appropriate control measures will be implemented including disinfection of the environment where necessary. If a food handler is infected, he/she should be immediately suspended from work until all stool examinations after treatment were negative of *V. cholerae*.

25. At regional and global levels, CHP provides figures on laboratory-confirmed cholera cases to the WHO on a regularly basis, and keeps close surveillance on outbreaks in neighbouring cholera-affected countries to prevent any cross-border spread.

#### Use of cholera vaccines in risk areas

26. Two types of oral cholera vaccines (OCV), namely Dukoral and Shanchol, are currently available. Both are whole-cell killed vaccines and effective against the *V. cholerae* O1 strain. Shanchol, which is licensed in India and pending WHO prequalification, also offers protection against the O139 serogroup (Table 2). On the other hand, Dukoral, the only WHO prequalified oral cholera vaccine is licensed and available in over 60 countries/ areas, including Hong Kong. The vaccine is primarily used as a vaccine for travellers to endemic areas. It is given in two doses, between seven days and six weeks apart, for adults and children aged 6 years and above. Children aged 2-5 years should receive 3 doses, between seven days and six weeks apart per dose. Dukoral is not recommended for children aged under 2 years. If the interval between doses is delayed for more than six weeks, the primary course should be restarted. Vaccination should be completed at least 7 days before departure. The vaccine could offer short-term protection up to 85-90% at all age groups (for aged  $\geq 2$  years) at 6 months after immunisation (36). Booster dose against cholera is recommended after 2 years for adults and children aged  $\geq 6$  years, and every six months for children aged 2-5 years if a continuing risk of infection exists (4). Severe reactions are uncommon except some gastrointestinal symptoms which have been previously reported in some clinical trials (37).

Table 2. Vaccine characteristics of DUKORAL<sup>®</sup> and SHANCHOL<sup>®</sup> (4, 36-38)

	Killed whole cell B-subunit cholera oral vaccine <b>Dukoral</b>	Killed bivalent whole cell cholera oral vaccine <b>Shanchol</b>
Trade name (Manufacturer)	DUKORAL <sup>®</sup> (by Crucell Sweden AB)	SHANCHOL <sup>®</sup> (by Shantha Biotechnics Limited)

Registration	Registered in Hong Kong	Not registered in Hong Kong
Strain/Antigen	Killed whole <i>Vibrio cholerae</i> O1 strains (serotypes: Inaba & Ogawa; biotypes El Tor & classical) plus recombinant B-subunit of cholera toxin (rCTB)	<i>Vibrio cholerae</i> O1 & O139 without cholera toxin B subunit (CTB)
Administration route	Oral	Oral
Dosing schedule	<p><u>Primary series</u>  Aged <math>\geq 6</math> years : 2 doses, 7 days – 6 weeks apart  Aged 2-5 years : 3 doses, 7 days – 6 weeks apart  (If the second dose is delayed for more than 6 weeks, vaccination should be restarted)</p> <p><u>Booster</u>  Aged <math>\geq 6</math> years : 1 booster dose after 2 years  Aged 2-5 years : 1 booster dose every 6 months</p>	<p><u>Primary series</u>  2 doses, given 2 weeks apart</p> <p><u>Booster</u>  A booster dose after 2 years</p>
Target population	Persons aged $\geq 2$ years	Persons aged $\geq 1$ year
Efficacy	Protective efficacy of 85%-90% 6 months after second dose in vaccinees aged $\geq 2$ years	Protective efficacy of 66% for all ages of vaccinees after second dose
Adverse effects	Gastrointestinal symptoms such as abdominal pain, diarrhoea, loose stools, nausea and vomiting in some clinical trials	Fever and gastrointestinal symptoms such as diarrhoea, vomiting, abdominal pain, nausea, etc. Adverse events are less frequently reported after the second dose as compared to the first
Contraindications	<p>Hypersensitivity to active substances of ingredients of the vaccine</p> <p>Current acute gastrointestinal illness or febrile illness</p>	<p>Hypersensitivity to active substances of ingredients of the vaccine</p> <p>Current acute gastrointestinal illness or febrile illness</p>

	(No animal data on reproduction toxicity are available. No specific clinical studies have been performed to address safety during pregnancy and to breast-feeding women)	(No specific clinical studies have been performed to evaluate the safety and immunogenicity of the vaccine in pregnant women and for the foetus)
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27. However, as recommended by the WHO, cholera vaccine should only be used in conjunction with other prevention and control strategies such as improving water quality and sanitation measures in areas where the disease is endemic and be considered for use in areas at risk of outbreaks. It is not indicated for most travellers but may be considered for travellers at high risk, e.g. areas with cholera outbreak, humanitarian relief workers in disaster areas (36).

28. Chemoprophylaxis for travellers going to or coming from cholera-affected areas is strongly discouraged as it has no effect on controlling the spread of the disease, but may adversely increase one's antimicrobial resistance. Parenteral cholera vaccines have never been recommended by WHO because of its significant high occurrence of adverse reactions and low protective efficacy (15).

29. Since vaccination against cholera cannot prevent the introduction of the infection into a country, WHO amended the International Health Regulations in 1973 so that cholera vaccination is no longer be required of any traveller. Currently, no country officially requires proof of cholera vaccination as a condition for entry (15).

### **Food surveillance and control**

30. Food surveillance is an important component of cholera control strategy. Overseas countries such as the United States, Canada and the United Kingdom have been conducting active surveillance and monitoring programmes of food-borne pathogens over the years. In Hong Kong, Centre for Food Safety (CFS) of the FEHD conducts regular food surveillance at import, wholesale and retail levels to ensure food safety. Marine products and ready-to-eat food samples (such as oyster, sashimi and sushi) are collected for testing of enteropathogens, including *V. cholerae*. During 2006 - 2010, around 3250 ready-to-eat food samples were taken for microbiological testing and all results were negative for *V. cholerae* O1 and O139. Further follow-up actions, such as source tracing and legal prosecution, will be carried out as appropriate in case any positive result is detected. The food surveillance results are also announced to the public on a regular and timely basis.

## Water sampling and surveillance

31. Since there have been incidents of cholera cases related to fish tank water contaminated by *V. cholerae*, in order to enhance the quality of fish tank water at source, wholesale and retail level, FEHD takes samples of fish tank water from stalls/premises selling live marine seafood at bi-monthly intervals for testing of *E. coli* and the presence of *V. cholerae* every year. Routine inspection of filtration and disinfection facilities for keeping live fish and shellfish are also conducted when water samples are taken. When samples are found to exceed the prescribed standard, investigations at the premises or market stalls will be conducted immediately to detect the source of the contamination and follow-up samples will be collected. Once the presence of highly pathogenic *V. cholerae* is detected in a water sample, FEHD will close the premises concerned on public health grounds under the authority conferred by section 128C of the Public Health and Municipal Services Ordinance (Cap. 132).

32. FEHD has also drawn up and issued detailed guidelines to seafood traders on the proper procedures for disinfection methods and management practices that should be observed for better quality control of fish tank water. In view of the concern on the water quality of fish tank water, starting August 1, 2010, legislation has been introduced to prohibit extraction of seawater from specified areas for keeping live fish or shellfish for human consumption.

## Health education to public, travellers and food trade

33. In addition to routine surveillance and inspection, education to promote good personal and food hygiene are of paramount importance in preventing cholera infection. Fact sheet on cholera and related health advice are available for the general public at the CHP website. For travellers, the Travel Health Service of the Department of Health provides latest news and alerts about overseas cholera outbreaks that are of importance to travellers going to cholera-affected countries. Specific health advice on cholera is also available on their website and at the two Travel Health Centres. CFS has also produced a wide variety of health education materials and pamphlets for the food trade and the general public to heighten their awareness of the infection when preparing food, in particular seafood. Educational measures include organisation of regular seminars and talks on food hygiene for the food trade and the general public.

## Summary and Recommendations

34. With the well-developed infrastructure on the health care and hygiene systems, cholera incidence has been on the decline in recent years, with the majority being sporadic cases imported from neighbouring areas.

Although cholera is no longer a pressing health threat to Hong Kong, it may still cause significant mortality and is potentially fatal if not properly managed and controlled. To minimise the risk of cholera infection, the following measures are recommended:

#### Disease monitoring and control

- (a) On-going disease surveillance and early reporting of cholera cases to facilitate epidemiological investigation and outbreak detection
- (b) Stringent cholera control measures (e.g. infection control, environmental disinfection, medical surveillance) to prevent secondary spread in the community
- (c) Close international collaboration and monitoring of cholera outbreaks in neighbouring countries to avoid cross-border spread

#### Food and water safety

- (a) Enforcement of food and environmental regulations to maintain a high standard of food safety and hygiene practices
- (b) Reinforcing the importance of food and water safety and provide trainings for food handlers and seafood traders to reduce the risk of cholera and other enteric infections

#### Public health education

- (a) Raising the awareness of general public about the risks of cholera infection through various channels and promoting the importance of good personal and food hygiene
- (b) Health advice for travellers to adopt appropriate preventive measures when travelling to cholera risk areas

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