Infection prevention measures for
Clostridium difficile
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Introduction

*Clostridium difficile* is the main cause of diarrhoea in healthcare institutions. According to incidence figures from 13 hospitals, the frequency in the Netherlands is 10-20 cases per 10,000 patient admissions (personal notification). Aside from this endemic occurrence, the bacterium also causes epidemics. One such epidemic occurred in 2005 in a number of hospitals and nursing homes, and involved *Clostridium difficile* ribotype O27. This also leads to major epidemics in hospitals in Canada and the UK [1-4].

The prevention of *Clostridium difficile*-associated diarrhoea (CDAD) is based on two principles: limited use of antibiotics and hygiene measures. This guideline only discusses the hygiene measures. The fact that *Clostridium difficile* produces spores is a complicating factor in this. Contrary to the vegetative form of the bacteria, these can survive in the environment for months. Spores are also resistant to the commonly used surface disinfectants.

The ‘Centrum voor Infectieziektebestrijding’ [Centre for Infectious Disease Control] has drawn up a strategy for handling epidemics of *Clostridium difficile* O27 (Website www.infectieziekten.info, under ‘Draaiboeken’ [Strategies]).

Pathogenesis

The current point of view on the development of CDAD is that – usually through the use of antibiotics – the balance of the patient’s intestinal flora is disturbed, resulting in reduced resistance to colonisation. The patient then becomes colonised with *Clostridium difficile*. The majority of patients become asymptomatic carriers and these patients are protected from developing CDAD later. A small proportion of patients develop diarrhoea, resulting from damage to the intestinal mucosa caused by the cytotoxins produced by the bacteria [5, 6].

Patients with CDAD are a source of contamination. It is not clear whether the asymptomatic carriers are also sources of contamination [7]. The patient’s environment, such as the floor, toilet area, bathroom, bed, bedside table, bedpan, toilet chair and telephone, is contaminated. The role of the contaminated environment in the transmission of *Clostridium difficile* has not been scientifically proven. This guideline does take into account the possibility of the environment playing a role in transmission. Transmission takes place through direct and indirect contact.

Risk factors

The risk factors for colonisation and infection with *Clostridium difficile* are [8-14]:

- old age
- gender (affects more females than men)
- severity of underlying illness
- duration of admission
- use of antibiotics
- use of laxatives
- use of antacids
- manipulations to the digestive tract: gastric catheter, gastrostomy, postpyloric tube feeding
- faecal incontinence

None of these risk factors can be influenced through hygiene measures.
1 Isolation measures

Contact isolation is indicated, as described in the WIP guideline of the same name [15], supplemented with a few extra precautions specifically for the prevention of contamination with *Clostridium difficile*.

- A patient with diarrhoea, (suspected of being) caused by contamination with *Clostridium difficile*, must be cared for in a single-patient room, fitted with its own toilet. The use of an isolation room with an anteroom is not necessary.
  
  Reason: In view of the high risk of transmission of bacterial spores in the patient’s environment, the patient may not (continue to) stay on a ward.

- If a fellow patient contracts diarrhoea, this fellow patient must also be cared for in a single-patient room, fitted with its own toilet.
  
  Contact isolation of a patient suspected of having a *Clostridium difficile* infection may be discontinued if the results of two toxin tests for *Clostridium difficile*, taken at a 24-hour interval, are negative.

- The patient may not use a shared toilet, even if no toilet is available in or near the single-patient room. In that case a bedpan must be used, which the nurse must then immediately empty, clean and disinfect in a bedpan washer. If a toilet chair is used, it must be patient-specific, meaning that it is used for the relevant patient only.

- Non-sterile gloves must be put on when entering the room, and a protective apron must be worn when caring for the patient.
  
  In accordance with the general precautions, personal protective equipment must be used if necessary. In view of the high risk of contamination with *Clostridium difficile* when caring for the patient, a protective apron must be worn at all times.

- When leaving the room, and after removing the gloves and the apron, the hands must be washed thoroughly with soap and water and dried with a paper towel.
  
  We explicitly point out that the use of hand alcohol has little to no effect on bacterial spores and therefore has no added value in this case.

- Contact isolation of a patient diagnosed with *Clostridium difficile* may only be discontinued once the diarrhoea has stopped.
  
  In practice this means a normal defecation pattern for a period of 48 hours.

1.1 Patient toilet hygiene

The nursing staff must give the patient a good explanation on optimum toilet hygiene.

- The patient should be instructed on good hand hygiene (was with soap and water, and dry thoroughly) after using the toilet.

- The patient must be advised to flush the toilet with the lid closed (if present) after use, to prevent the release of aerosols during flushing.

2 Cleaning and disinfection

*Clostridium difficile* spores are resistant to the most commonly used surface disinfectants (chlorine and alcohol). This means that killing these spores requires far longer contact times and higher concentrations of these agents than would normally be used. Under laboratory conditions a contact time of 20 minutes with 1000 ppm chlorine is required to achieve a reduction of over 99% [16]. Using 5000 ppm chlorine this can be achieved in about 7 minutes.
In practice the number of spores present may be lower than in the effectiveness test. On the other hand, the conditions in which the disinfectant is used are far less favourable because the agent is applied to a surface, the contact time is difficult to achieve, and organic material may be present.

A study conducted in the United Kingdom in which the use of 1000 ppm chlorine was compared with a cleansing agent showed no reduction in contamination of the environment or the hands of staff. There appeared to be a decrease in the number of patients with CDAD in one of the departments studied; however, this was not the case for the other department [17]. An American study with a 1:10 dilution of hypochlorite (5000 to 6000 ppm free chlorine) showed a significant reduction in patients with CDAD [18]. These studies confirm that disinfection with chlorine is only effective in very high concentrations, which involve occupational health & safety issues.

Hydrogen peroxide and a substance similar to peracetic acid are mentioned as alternatives to chlorine and alcohol [16, 19, 20]. Hydrogen peroxide also requires high concentrations and a long contact time, which is difficult to realise in practice [16]. Hydrogen peroxide is not approved for use as a surface disinfectant in the Netherlands. The substance resembling peracetic acid is, under laboratory conditions, more effective than 1000 ppm chlorine: it provides a 6 log reduction after 10 minutes of exposure. Further research is needed to determine whether this agent can contribute to combating *Clostridium difficile* in practice.

Taking all this into account, the Working Party emphasises the importance of optimal cleaning of objects and the environment.

### 2.1 General

- Cleaning should take place by means of a damp method as much as possible, e.g. by using microfibre cloths.
- The cleaning equipment must be patient-specific. If this is not possible, the room of the patient with *Clostridium difficile* should be cleaned last each day.
- The cleaning materials should be either disposable, and disposed of immediately after use, or reusable, and washed in the washing machine immediately after use.

### 2.2 Cleaning the patient’s room

- Cleaning the patient’s environment requires extra attention.

### 2.3 Cleaning and disinfection of medical and nursing instruments and equipment

- Instruments and equipment are patient-specific and should be cleaned carefully. Once they have been dried, they are disinfected as usual with 70% alcohol and then air dried.
- The disinfection process itself can be carried out effectively in the instrument washer and endoscope washer, because the disinfectants and/or temperature used for this are sufficient for the inactivation of clostridium spores.
- Blood pressure cuffs and the like must be washable, and must be cleaned and dried thoroughly once the isolation period has been completed.
- Disposable blood pressure cuffs can be used instead of washable blood pressure cuffs.
3 Waste

Waste from the patient’s room does not require any special processing and can be dispensed of as normal industrial waste.

4 Epidemic situation

If one or more cases of CDAD are identified within a healthcare institution and the illness becomes (a possible) epidemic, cohort nursing is a possibility. Cohort nursing means that patients or clients colonised with the same microorganism are cared for together (in the same ward or department), preferably by a small fixed group of nurses who do not come into contact with other patients.

Within a cohort, patients or clients may use a shared toilet.

The toilet must be cleaned at least three times a day, and more often if necessary. For cohort nursing to succeed, all prescribed measures must be strictly observed.
Appendix A. References


16 Perez J, Springthorpe VS, Sattar SA. Activity of selected oxidizing microbicides against the spores of Clostridium difficile: Relevance to environmental control. CREM 2005.


