Sources of *Clostridium difficile* infection

A gene sequencing study of faecal samples from inpatients with *Clostridium difficile* infection in Oxford finds that almost half had acquired infection from sources other than another symptomatic patient.

**Overview:** *Clostridium difficile* is present in small numbers in the gut of healthy people. *C difficile* spores can be passed from the body and persist on surfaces for weeks or months. The resilience of the spores means that *C difficile* can be spread by people, animals, and in water or food (*Hensgens et al. 2012*). Other people who come into contact with infected people or contaminated surfaces can themselves become infected if they ingest these spores (*Health Protection Agency*, now part of *Public Health England*).

In people whose gut microbiome has been disturbed by antibiotics, *C difficile* can grow to levels that cause illness. Many cases of *C difficile* infection occur in places where lots of people on antibiotics are in close contact, such as in hospitals and care homes (*NHS Choices 2014*).

**Current advice:** NICE guidance on *infection control in primary care and community care* recommends that everyone involved in providing care should be educated about the standard principles of infection prevention and control and trained in hand decontamination and the use of personal protective equipment. Patients and carers should likewise be educated about:

- the benefits of effective hand decontamination
- the correct techniques and timing of hand decontamination
- when it is appropriate to use liquid soap and water or handrub
- the availability of hand decontamination facilities
- their role in maintaining standards of healthcare workers’ hand decontamination.

NICE guidance on *prevention and control of healthcare-associated infections in secondary care settings* provides recommendations to help organisations prevent and control infections. Key areas of practice that underpin infection prevention and control – such as hand hygiene, antimicrobial stewardship and environmental cleanliness – are covered. Recommendations include prioritising the need for a skilled, knowledgeable and healthy workforce that delivers continuous quality improvement to minimise the risk from infections and ensuring standards of environmental cleanliness are maintained and improved beyond current national guidance.

The NICE Pathway on *prevention and control of healthcare-associated infections* brings together all related NICE guidance and associated products on the area in a set of interactive topic-based diagrams.

**New evidence:** *Eyre et al. (2013)* undertook a gene sequencing study to determine what proportion of *C difficile* infections in hospital patients were the result of transmission from other symptomatic patients and what proportion were caused by infectious spores from alternative sources. Faecal...
samples from all inpatients with diarrhoea at 4 hospitals in Oxford were tested for *C. difficile* infection. Between September 2007 and March 2011, positive samples were cultured, and the cultured isolates underwent whole-genome sequencing. Isolates that differed by more than 2 single-nucleotide variants were judged to be genetically different. Data on hospital admissions, movement through the hospital, home postcode district and GP surgery were used to determine epidemiological relationships between patients whose isolates were genetically similar. Antibiotic use was not measured.

A total of 1223 faecal samples that were positive for *C. difficile* infection were successfully sequenced. A comparison of 957 isolates taken from April 2008 to March 2011 with those obtained from September 2007 onwards found that 624 (65%) were not genetically similar. A total of 428 (45% overall) differed by more than 10 single-nucleotide variants, suggesting transmission from a source other than another infected inpatient.

Of the 333 patients (35% overall) whose samples were genetically similar to previous patients, 126 (38%) had ward contact with the related case, 5 (2%) were potentially linked by ward-based contamination after the discharge or recovery of an infectious patient, 29 (9%) shared time in the same hospital but were never on the same ward, and 21 (6%) had both ward contamination and hospital-wide contact. For the remaining 152 (46%) patients, no hospital-based contact with other symptomatic patients could be established. Around 1 in 5 (21%) of these 152 people used the same general practice or lived in the same postcode district, but 120 patients (36%) had no record of any hospital or community contact with a previous genetically related case. A drop in the incidence of both genetically related and genetically similar cases of *C. difficile* infection was observed during the study period, with no significant between-group difference in the reduction.

The authors concluded that many cases of *C. difficile* infection arise from sources other than direct hospital or community contact with infected patients. They suggested that cases whose *C. difficile* infection differed significantly from other previous cases may have been infected by asymptomatic people or by an environmental reservoir. Patients with genetically related strains who did not have hospital or community contact could also have been exposed to a common source.

**Commentary:** “The key new finding of this study is that a substantial proportion of new cases of *C. difficile* infection do not arise from direct contact with other symptomatic cases in hospital or the community. The study also demonstrated that reductions in the incidence of genetically related *C. difficile* infection were similar to reductions in genetically distinct *C. difficile* infection, suggesting that interventions targeting the transition from exposure to disease, rather than those targeting just patient-to-patient transmission, likely played a significant role in reducing *C. difficile* infection in this population.

“Current UK guidance emphasises the importance of infection control interventions and good antimicrobial stewardship in combination to control *C. difficile* infection. This new evidence strengthens the rationale supporting this combined approach, because better antibiotic prescribing reduces the number of patients developing *C. difficile* infection regardless of source of acquisition.

“More research is required to determine how cases of *C. difficile* infection without direct contact with symptomatic patients acquire their infection. Although the authors speculate on the roles of environmental exposure and asymptomatic carriage, this study did not examine these factors. Finally, this study indicates that using absolute case counts to measure the effectiveness of hospital performance in controlling nosocomial *C. difficile* transmission may be misleading.” – **Professor John E Coia, Director of the Scottish *C. difficile* Reference Service, Department of Clinical Microbiology, Glasgow Royal Infirmary.** Professor Coia has participated in advisory boards and has delivered educational presentations at non-promotional meetings for Astellas Pharma in the last 12 months. He is currently participating in a multicentre epidemiological study on recurrent *C. difficile* infection that is funded by Merck Sharp & Dohme

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