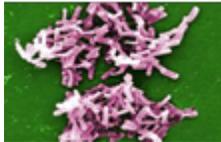


CLOSTRIDIUM DIFFICILE DISEASE

OVERVIEW



Clostridium difficile (*C. difficile*) is a **spore-forming bacterium that can cause serious intestinal disease that is potentially life-threatening**. The risk of contracting a *C. difficile* infection (CDI) increases with age, antibiotic treatment and time spent in hospitals or nursing homes, where outbreaks can lead to multiple cases.¹ Despite improvements in reducing some healthcare-associated infections (HAIs), *C. difficile* remains at high levels.² Increases in incidence and mortality of CDIs may be attributed to the emergence and spread of hypervirulent strains of the bacteria.³ These strains (such as BI/NAP1/027) have raised concerns about how to both control and prevent transmission of the bacteria in the environment. In addition, surges in the detection of CDI in the community and in previously low-risk populations pose new challenges that public health officials and healthcare providers will need to face.⁴

CAUSE

A main source of *C. difficile* is infected patients who release spores into the environment that can then infect other patients. When antibiotics disrupt the gut's normal flora and a person has ingested *C. difficile* spores, the *C. difficile* bacteria can multiply and release potent toxins that can damage a patient's intestinal lining and cause disease.⁴ Eliminating *C. difficile* spores is extremely difficult because they can survive routine environmental cleaning with soap and water, as well as hand sanitization with alcohol-based gels.¹

RISK FACTORS

Those most at risk are older adults who take antibiotics and also receive medical care.² Advanced age correlates with severity of disease, likelihood of recurrence and CDI-associated death.³ Contributing risk factors include antibiotic exposure, long stays in a healthcare setting, use of proton pump inhibitors, gastrointestinal surgery/manipulation, serious underlying illness and/or immune-compromising conditions.¹

PATIENT IMPACT

Signs and symptoms range from mild diarrhea without other symptoms to fever and severe diarrhea with dehydration, nausea, loss of appetite and abdominal pain. CDI can result in perforations of the colon, sepsis, pseudomembranous colitis and toxic megacolon, a potentially life-threatening condition.¹ Trials conducted in the United States (U.S.) have shown that CDI can recur in up to 30 percent of patients 30 to 60 days after treatment is stopped.⁵



CURRENT TREATMENTS

In about 20 percent of patients, CDI will resolve within two to three days of discontinuing the antibiotic to which the patient was previously exposed. It can also be treated with an appropriate course (approximately 10 days) of antibiotics.¹ Most recently, faecal microbiota collected from healthy individuals are being investigated to treat CDI. Some data suggest that use of faecal microbiota transplantation to restore intestinal flora may be an effective therapy in the management of refractory CDI.⁷

METHODS OF PREVENTION

There currently are **no approved vaccines or antibiotics indicated for the prevention of CDI on the market today.**

STATISTICS BY REGION

United States

- The Centers for Disease Control and Prevention (CDC) listed *C. diff* among microorganisms with a threat level of urgent in a 2013 report on antibiotic resistance threats in the U.S.⁶
- At least 14,000 fatalities are attributed to *C. diff* each year.⁶
- Deaths related to *C. diff* increased 400 percent between 2000 and 2007, in part because of a more virulent bacterial strain that emerged.⁶
- Almost half of CDIs occur in people younger than 65, but more than 90 percent of deaths occur in people 65 and older.²
- It is estimated that 250,000 CDIs per year require hospitalization or affect already hospitalized patients.⁶
- From 2000 to 2009, the number of hospitalized patients with any CDI discharge diagnoses doubled to 336,600.³
- The vast majority of *C. difficile* infections are connected to getting medical care.²
- Analysis of the best available data indicates that CDI may have resulted in up to \$4.8 billion in excess costs in U.S. acute-care facilities during 2008.⁵
- In 2009, hospital stays in which *C. diff* was a principal diagnosis averaged 6.9 days and \$10,100. When *C. diff* was a complicating factor to already complex principal diagnoses (e.g. septicemia, pneumonia, congestive heart failure, renal failure), hospital stays more than doubled and costs more than tripled (16 days and \$31,500, respectively).⁸
- Studies have shown that CDI recurs in 20 to 30 percent of patients 30 to 60 days after CDI treatment is stopped, but not all of these patients are readmitted to the hospital for management of CDI. Hospital-related data indicate that approximately 15 percent of patients with a diagnosis of CDI are readmitted with recurrent CDI 30 to 60 days after the initial episode. This suggests that 50 to 75 percent of first recurrences result in a new hospital admission.⁵



Canada

- From 2007 to 2011, the total number of deaths directly or indirectly related to a diagnosis of healthcare-associated CDI rose from 33 to 88 per year.⁹
- The overall number of healthcare-associated CDI cases in 2011 was estimated to be 3,181, with an incidence rate of 5.35 per 1,000 patient admissions.⁹
- A study conducted from July 2002 to March 2009 utilizing the Ottawa Hospital Data Warehouse found that acquiring CDI while in the hospital increased the median length of stay by six days.¹⁰

Europe

- The European Centre for Disease Protection and Control (ECDC) has estimated the potential cost of CDI to be €3 billion per annum and expects this number to almost double over the next four decades.¹¹
- The ECDC has estimated the impact of CDI at €5,000-15,000 per case in England.¹¹
- A study of four European national hospital discharge databases found that patients in England (2007-2009) had the longest additional hospital stays attributable to CDI at 16.09 days, followed by Germany (2008-2010) at 15.47 days, Spain (2008-2010) at 13.56 days and The Netherlands (2008-2009) at 12.58 days.¹²

Asia Pacific

- According to the existing evidence, CDI occurs at similar rates in Asia as in other continents where CDI is more commonly recognized and researched. Although relatively few studies on *C. diff* have been performed in Asia, what work has been done demonstrates that CDI is a significant cause of nosocomial disease in Asian countries.¹³
- Available data in East Asia comes from a country-wide survey of 17 tertiary hospitals in Korea from 2004 to 2008, which found that the incidence of CDI increased from 1.7 to 2.7 per every 1,000 adult admissions.¹³
- Between October 2010 and March 2011, 477 cases of CDI were identified in Victoria, Australia, by the Healthcare Associated Infections Surveillance System. Of these incidences, 74.6 percent occurred in patients aged 60 years or over.¹⁴

¹ Centers for Disease Control and Prevention. Frequently Asked Questions about Clostridium difficile for Healthcare Providers. Centers for Disease Control and Prevention. http://www.cdc.gov/HAI/organisms/cdiff/Cdiff_faqs_HCP.html. Last Updated March 6, 2012. Accessed April 16, 2014.

² Centers for Disease Control and Prevention. Vital Signs - Making Health Care Safer: Stopping *C. difficile* Infections. Centers for Disease Control and Prevention. <http://www.cdc.gov/VitalSigns/HAI/index.html>. Last Updated March 6, 2012. Accessed April 16, 2014.

³ McDonald LC. Vital Signs - Preventing Clostridium difficile Infections. Centers for Disease Control and Prevention - Morbidity and Mortality Weekly Report. March 6, 2012; 61(09):157-162. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6109a3.htm?s_cid=mm6109a3_w.

⁴ Lessa F, Gould C, and McDonald LC. Current Status of Clostridium difficile Infection Epidemiology. Clinical Infectious Diseases. August 2012; 55(Suppl 2): S65-S70. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3388017/?report=classic>.

⁵ Dubberke E and Olsen M. Burden of Clostridium difficile on the Healthcare System. Clinical Infectious Diseases. August 2012; 55(Suppl 2): S88-S92. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3388018/>.

⁶ Centers for Disease Control and Prevention. Threat Report 2013. Centers for Disease Control and Prevention. <http://www.cdc.gov/drugresistance/threat-report-2013/>. Last Updated September 16, 2013. Accessed April 16, 2014.



⁷ U.S. Food and Drug Administration. Guidance for Industry: Enforcement Policy Regarding Investigational New Drug Requirements for Use of Fecal Microbiota for Transplantation to Treat Clostridium difficile Infection Not Responsive to Standard Therapies. U.S. Department of Health and Human Services. <http://www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Guidances/Vaccines/ucm361379.htm>. Last Updated July 18, 2013. Accessed April 16, 2014.

⁸ Lucado J, Gould C, and Elixhauser A. Clostridium difficile Infections (CDI) in Hospital Stays, 2009. Healthcare Cost and Utilization Project (HCUP) Statistical Brief #124. January 2012. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb124.pdf>.

⁹ The Canadian Nosocomial Infection Surveillance Program (CNISP). Healthcare-Associated-Clostridium difficile Infection (HA-CDI) 2007-2011. Public Health Agency of Canada. <http://www.phac-aspc.gc.ca/nois-sinp/projects/cdad-eng.php>. Last Updated November 22, 2013. Accessed April 16, 2014.

¹⁰ Forster A, Taljaard M, Oake N, Wilson K, Roth V, and van Walraven C. The effect of hospital-acquired infection with Clostridium difficile on length of stay in hospital. Canadian Medical Association Journal (CMAJ). December 2011; DOI:10.1503/cmaj.110543. <http://www.cmaj.ca/content/early/2011/12/05/cmaj.110543.full.pdf+html>.

¹¹ European Centre for Disease Prevention and Control. Clostridium Difficile Infection: Basic Facts. European Centre for Disease Prevention and Control. http://www.ecdc.europa.eu/en/healthtopics/Healthcare-associated_infections/clostridium_difficile_infection/Pages/basic_facts.aspx. Accessed April 16, 2014.

¹² Eckmann C, Wasserman M, Latif F, Roberts G, and Beriot-Mathiot A. Increased hospital length of stay attributable to Clostridium difficile infection in patients with four co-morbidities: An analysis of hospital episode statistics in four European countries. The European Journal of Health Economics. October 2013; DOI 10.1007/s10198-013-0498-8. <http://link.springer.com/article/10.1007/s10198-013-0498-8#>.

¹³ Collins D, Hawkey P, and Riley T. Epidemiology of Clostridium difficile infection in Asia. Antimicrobial Resistance and Infection Control. 2013; 2:21. <http://www.ncbi.nlm.nih.gov/pubmed/23816346>.

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CONTACT:

Global Media Relations

Alain Bernal

T. +33-4-37-37-50-38

alain.bernal@sanofipasteur.com

www.sanofipasteur.com