

## Epidemiology of *Clostridium difficile*-associated infections

F. Barbut and J.-C. Petit

Research Group on *Clostridium difficile*, Center Hospitalo-Universitaire Saint-Antoine, Assistance Publique-Hôpitaux de Paris, Université Pierre et Marie Curie, Paris, France

*Clostridium difficile* is responsible for 15–25% of cases of antibiotic-associated diarrhea (AAD) and for virtually all cases of antibiotic-associated pseudomembranous colitis (PMC). This anaerobic bacterium has been identified as the leading cause of nosocomial infectious diarrhea in adults and can be responsible for large outbreaks. Nosocomial *C. difficile* infection results in an increased length of stay in hospital ranging from 8 to 21 days. Risk factors for *C. difficile*-associated diarrhea include antimicrobial therapy, older age (>65 years), antineoplastic chemotherapy and length of hospital stay. Other interventions with high risk associations are enemas, nasogastric tubes, gastrointestinal surgery and antiperistaltic drugs. Prospective studies have shown that nosocomial transmission of *C. difficile* is frequent but often remains asymptomatic. Patients can be contaminated from environmental surfaces, shared instrumentation, hospital personnel hands and infected roommates. Once an outbreak starts, *C. difficile* may be spread rapidly throughout the hospital environment where spores may persist for months. Measures that are effective in reducing incidence of *C. difficile* infections and cross-infection include: (i) an accurate and rapid diagnosis, (ii) appropriate treatment, (iii) implementation of enteric precautions for symptomatic patients, (iv) reinforcement of hand-washing, (v) daily environmental disinfection, and (vi) a restrictive antibiotic policy. *C. difficile* is a common cause of infectious diarrhea and should be therefore systematically investigated in patients with nosocomial diarrhea.

**Keywords** *Clostridium difficile*, diarrhea, colitis, nosocomial infections, epidemiology

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### INTRODUCTION

*Clostridium difficile* is a spore-forming Gram-positive anaerobic bacillus that was first isolated from stools of neonates in 1935. Forty years later, this bacterium has been recognised as the main cause of pseudomembranous colitis (PMC) and antibiotic-associated colitis and diarrhea—the *C. difficile*-associated disease (CDAD) [1,2]. Since then, studies concerning the pathogenesis, diagnosis and treatment of *C. difficile*-associated infections have increasingly been reported. In this paper, we review the current knowledge of epidemiological features related to *C. difficile*.

### CLINICAL PRESENTATIONS

Clinical presentations of *C. difficile* range from mild diarrhea to life-threatening PMC with megacolon and possible perforation.

*C. difficile* toxin B has been isolated from stools of more than 95% of PMC cases and of 15–25% cases of antibiotic-associated diarrhea (AAD) (Table 1) [1]. During the past 20 years, toxigenic *C. difficile* has emerged as a major cause of nosocomial diarrhea and has been responsible for large outbreaks in hospital settings [3,4]. In many hospitals, *C. difficile* is the most common enteropathogen isolated from stool cultures.

However, isolation of *C. difficile* must be interpreted with caution because asymptomatic carriage is usually observed in less than 3% of healthy adults [1]. Carriage rates are higher in patients with previous hospitalisation or in patients who have previously received antibiotics. It is not known if this carriage rate represents transient colonisation or a component of the stable flora.

### Pathogenesis

More than 90% of *C. difficile* infections occur after or during antibiotic treatment. Antibiotics act by disrupting the normal colonic flora, allowing *C. difficile*, from endogenous or exogenous origins, to establish itself in the colon and proliferate. If the strain is toxigenic, toxins A and B are produced simultaneously in almost all cases, causing fluid secretion, inflammation

Corresponding author and reprint requests: J.-C. Petit, Service de Microbiologie, Hôpital Saint-Antoine, 184 rue du faubourg Saint-Antoine, 75012 Paris, France

Tel: +33 1 49 28 22 51

Fax: +33 1 49 28 24 72

E-mail: jean-claude.petit@sat.ap-hop-paris.fr