

Editorial

Nosocomially Acquired *Pseudomonas cepacia* Infection in Patients with Cystic Fibrosis

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Pseudomonas cepacia is a significant respiratory pathogen in patients with cystic fibrosis (CF).¹⁻⁶ Since the first reports of its increasing prevalence and association with rapid pulmonary function decline and unexpected deaths,^{1,2,7} many studies have been conducted in attempts to elucidate its epidemiology in CF patients.^{3,8-14} Surveillance in more than 100 United States CF centers has shown that, since 1986, when center laboratories started routinely using *P cepacia*-selective media for cultures of sputum specimens from patients with CF,¹⁰ annual incidence and prevalence of PC infection or colonization have plateaued at 1% and 3.5% respectively. The impact of *P cepacia* has varied from center to center, however. Yearly center incidence and prevalence range from 0% to 7% and 0% to 27% respectively, with most *P cepacia*-colonized patients being concentrated in a few large CF centers.¹⁵

In many respects, the epidemiology of *P cepacia* in CF patients appears to resemble that of *P aeruginosa*, an organism that has long been prevalent in the respiratory flora of patients with CF.^{6,17} Both microorganisms have a predilection for CF patients with severe pulmonary impairment, and both can cause chronic respiratory-tract colonization that is difficult to eradicate and is associated with intermittent exacerbations of bronchitis or pneumonia.^{3,6,9,17} Both have been associated with decreased survival and deterioration of pulmonary function in colonized patients, although a cause-and-effect relationship has not been firmly established with either organism.^{2,3,9,17-22} In

addition, both *P cepacia* and *P aeruginosa* have similar habitats: They can be found in soil and water; their hospital reservoirs are moist environments.²³⁻²⁷

Several features distinguish *P cepacia* infection from *P aeruginosa* infection of the CF patient's respiratory tract. First, although the virulence and pathogenic properties of *P cepacia* are still poorly understood,^{6,12,28-33} *P cepacia* septicemia and/or necrotizing pneumonia, accompanied by rapid pulmonary-function deterioration and culminating in death, have been documented in patients with mild or moderate CF, whereas reports of similar episodes attributable to *P aeruginosa* have been lacking in the literature.^{1,32-34} Second, most isolates of *P cepacia* are resistant to currently available antipseudomonas antimicrobials and present a major therapeutic challenge.³⁵⁻³⁷ Thus, many consider *P cepacia* infection of CF patients more serious than that due to *P aeruginosa*.

Data suggesting patient acquisition of *P cepacia* in the hospital make prevention of the nosocomial transmission of *P cepacia* important.^{2,3,9,38,40,41} The three possible modes by which *P cepacia* can colonize or infect the respiratory tract of CF patients in the hospital are: 1) from environmental reservoir to patient, 2) from person to person, and 3) by autoinfection of the respiratory tract with a strain that has colonized another body site.

Autoinfection of the respiratory tract with bacteria following colonization of other body sites such as the gastrointestinal tract or oropharynx has been

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Tablan OC. Nosocomially acquired *Pseudomonas cepacia* infection in patients with cystic fibrosis. *Infect Control Hosp Epidemiol.* 1993;14:124-126.

shown to occur in non-CF patients who acquire nosocomial gram-negative bacillary pneumonias.^{40,42,43} However, this mechanism has not been studied for *P cepacia* in CF patients.

Patient-to-patient transmission of multiresistant gram-negative bacilli in hospitals often occurs indirectly via hands of personnel or, less frequently, by direct close contact between patients.⁴⁴ Recent studies suggest that *P cepacia* may be transmitted between CF patients during close and prolonged contact^{3,9,47} and indicate that *P cepacia* can be transferred from hand to hand during casual hand contact between individuals.⁴¹ However, the exact mechanism by which *P cepacia* reaches the CF patient's lower respiratory tract during or after these contacts and the frequency of occurrence of this mode of transmission have not been determined. Prevention of patient-to-patient transmission of *P cepacia* in CF patients has been the subject of much debate.^{4,11,38,39,48} Until more is known about the role of person-to-person transmission of *P cepacia* in CF patients, adequate handwashing and other contact or barrier precautions that have been recommended for the prevention of nosocomially acquired pneumonia due to multiresistant microorganisms and are prudent practices to interrupt the spread of *P cepacia* within the hospital.⁴⁹⁻⁵¹

In this issue of *Infection Control and Hospital Epidemiology*, Drs. Burdge, Nakielna, and Noble report the transmission of *P cepacia* in the healthcare setting via a contaminated nebulization device. Although the ultimate source of the *P cepacia* found in the reusable nebulizer is not known, the epidemiologic evidence implicating nebulizer use as a risk factor for colonization with *P cepacia*, together with the isolation of *P cepacia* from the water reservoir of an inadequately disinfected nebulizer, strongly suggests that this equipment was the immediate source of the patients' *P cepacia* infection. The authors' conclusions could have been further strengthened, however, if the *P cepacia* strains obtained from the patients and the nebulizer were shown to be identical by molecular typing.^{13,52,53}

Inhalation of contaminated aerosols can result in direct deposition of microorganisms in the lower respiratory tract. This mode of bacterial transmission has been implicated in endemic and epidemic gram-negative bacillary nosocomial pneumonias.^{1,25,54-56} Nebulizer reservoirs become contaminated usually by unsterile water or medications or by hands of personnel or patients. Once contaminated, inadequate disinfection allows bacterial growth and multiplication and increases the risk of transmission of microorganisms to patients.⁵⁷

As a result of studies done in the 1960s implicating contaminated, inadequately disinfected nebulizers

as the source of endemic and epidemic gram-negative bacillary pneumonias,^{56,57} the Centers for Disease Control and Prevention has recommended the routine sterilization or high-level disinfection of nebulization devices between patient uses.⁵⁸

The report by Burdge et al emphasizes the need for infection control personnel to be vigilant not only in implementing contact-isolation precautions, but also in maintaining adequate sterilization or disinfection of respiratory-therapy or testing devices,⁵⁹ to prevent nosocomial transmission of *P cepacia* and other epidemiologically significant multiresistant microorganisms.

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