Editorial

Pseudomeningitis-Another Nosocomial Headache

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Since the initial description of pseudosepticemia by Nordon[1] in 1969 reports of pseudoinfections have slowly grown. Until 1981 when Kusek[2] reviewed the problem the majority of these were pseudobacteremias. Currently, virtually all types of pseudo-outbreaks/pseudoinfections have been reported, including pseudoendocarditis, pseudopneumonia, pseudoadenitis, pseudohepatitis, pseudowound infections, and pseudomeningitis.[3] The article entitled "Bacillus Species Pseudomenmgitis" by Lettau[4] and colleagues in this issue (pp 394-397) is the latest report of an outbreak of pseudomeningitis and is the first other report to date of *Bacillus* species being associated with pseudomeningitis.

Pseudoepidemicipseudoinfections may be defined as recovery of common/uncommon organisms by smear or culture from a body site that does not correlate clinically with the disease associated with the organism or the patient's disorder. In many of the pseudobacteremia outbreaks described in the literature patients were treated on the basis of initial blood culture reports and inappropriate antimicrobial therapy was initiated in many patients. The usual clinical clue to infection control personnel is the unexpected increase or clustering of usual or unusual microorganisms from microbiology laboratory data. The clinician's clue to pseudoinfections remains the apparent discrepancy between the disease usually produced by the isolate and the clinical disease entity. The greatest diagnostic confusion occurs when known pathogens are recovered that commonly cause disease (eg, *Pseudomonas, Staphylococcus aureus, Klebsiella*, etc). Therefore, it is predictable that pseudobacteremias which usually result from contaminated blood culture collecting or processing systems would result in the initiation of antimicrobial therapy since known pathogenic organisms have frequently been implicated in these outbreaks. Pseudopneumonias and pseudoendocarditis present similar problems, but are relatively rare causes of pseudoinfections.

Pseudomeningitis is an increasingly, although infrequent, serious problem. Since 1973 there have been 11 reports of pseudomeningitis associated with various microorganisms.[4-14] Since meningitis is serious, it is understandable that a relatively high proportion of these patients receive antimicrobial therapy. Furthermore, the initial organisms seen on Gram's stain or culture of the cerebrospinal fluid (CSF) were usually meningeal pathogens suggesting meningitis. The majority of the patients involved in these outbreaks had lumbar punctures performed for presumed meningitis, providing a difficult scenario to identify a pseudomeningitis outbreak. Most outbreaks involved contaminated slides, specimen tubes, or transport media. The current report by Lettau[4] et al is interesting in that the organism implicated was unusual (*Bacillus* species), and intrinsically contaminated TSBF broth was the vehicle responsible for false positive CSF Gram stains and cultures (Table 1).

Intuitively one would think that *Bacillus* species would be easily viewed as contaminants and not mimic actual infections. However, since 1974 seven pseudoinfections associated with *Bacillus* species have been reported in the literature.[15-20] Except for the present report by Lettau[4] et al, all previous pseudoinfections associated with *Bacillus* species have been pseudobacteremias. Although the number of patients involved in the outbreaks has been large, the number of patients inappropriately treated has been relatively small (ie, 4 patients out of 134). Contaminated blood culture media or, more commonly, contaminated blood culture analyzers were the source of *Bacillus* contamination in the patients with pseudobacteremias. Single reports of pseudopneumonia and pseudomeningitis due to *Bacillus* attest to its ability to cause confusion in certain clinical situations (Table 2). Traditionally, *Bacillus* species are spore-forming, gram-positive rods found in soil. In the spore phase, the organisms can withstand adverse environmental conditions and return to the vegetative state when optimal conditions are pres-

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TABLE 1
PSEUDOMENINGITIS ASSOCIATED WITH ALL TYPES OF MICROORGANISMS

Author/Year	Microorganism	Organism Source	+CSF Gram's Stain	+CSF Culture	Patients Involved	Patients Treated
Musher & Schell/1973	Gram-negative cocci	Contaminated specimen tubes	4	0	4	0
Joyner et al/l 974	Gram-positive cocci	Contaminated slides	1	0	1	1
Weinstein et al/l975	Gram-negative cocci Gram-positive cocci	Contaminated specimen tubes	5	0	5	1
Coyle-Gilchrist et al11976	*Flavobacterium meningosepticum*	Contaminated skin prep soap	0	1	1	1
Ericsson et al/l 978	Gram-negative bacilli	Contaminated slides	10	0	10	5
Hoke et al/l979	Gram-negative bacilli	Contaminated transport media	2	0	2	2
CDC/1983	Gram-negative bacilli	Contaminated transport media	1	0	1	1
Harris et al/1983	*Salmonella typhimurium*	Contaminated pipette	0	*2*	*2*	1
Ullman & Cunha et al/l985	*Acinetobacter* CDC Group VE-1	Extrinsic contamrnated culture media	1	1	1	1
Strampfer & Cunha et al11987	*Aspergillus*	Extrinsic contamrnated culture media	0	1	1	0
Lettau et al/l 988	*Bacillus*	Contaminated TSBF broth	3	13	16	3

TABLE 2
PSEUDOINFECTIONS ASSOCIATED WITH *BACILLUS* SPECIES

Author/Year	Type of Pseudoinfection	Source of *Bacillus*	Patients involved	Patients Treated
Noble & Reeves/l 974	Pseudobacteremra	Contaminated blood culture media	26	0
MacDonald/l982	Pseudobacteremra	Contamrnated syringes	36	0
Berger/1983	Pseudobacteremia	Alcohol swab of contaminated blood culture analyzer	15	0
Crowley et al/1 983	Pseudobacteremia	Contamrnated blood culture analyzer	15	0
Gurevich & Cunha et al/l984	Pseudobacteremia	Contaminated blood culture analyzer	26	1
Goldstein & Abrutyn/1985	Pseudopneumonia	Contaminated fiberoptic bronchoscope		
Lettau et al/1988	Pseudomeningttis	Contaminated TSBF broth	16	3

ent. ***Bacillus*** species have been reported to cause disease under unusual clinical circumstances, eg, primarily in severely compromised leukopenic hosts.[21,22] The current report of ***Bacillus*** pseudomeningitis from a 700-bed teaching hospital in South Carolina illustrates this very point. Three patients received antimicrobial therapy based on the false positive Gram's stain result, and one patient was hospitalized solely on the basis of CSF Cram's stain. One patient involved in the outbreak was an oncology patient in whom ***Bacillus*** infections could potentially occur. ***Bacillus*** has also been reported to cause true meningitis under unusual circumstances, undoubtedly a concern for clinicians managing patients in this outbreak. Important in the recognition that false positive smears and cultures represented a pseudoepidemic rather than a real infection was indicated by the fact that the patients did not have ***Bacillus*** isolated from other body sights and that the clinical picture in most patients was inconsistent with disease caused by the clinical isolate. It is a credit to the infection control and microbiology staff of the hospital

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that they suspected pseudomeningitis early in the outbreak and quickly determined the ***Bacillus*** contamination.

Our own experiences emphasize the importance of pseudoinfections in the past decade. Winthrop-University Hospital is a 550-bed university-affiliated, community teaching hospital. Since 1983, we have had three problems with pseudoinfections. ***Bacillus*** dust contamination of a radiometric blood culture analyzer caused pseudobacteremia problems for months before we were able to pinpoint the source. We had two incidences of pseudomeningitis due to unusual organisms: *Aspergillus* and *Acinetobacter*/CDC Group VE-1 organisms. Clearly, if Winthrop-University Hospital as a single hospital has had three pseudoinfections during the past four years, others may be faced with similar problems.

Pseudoinfections will undoubtedly continue to be described in the literature. Careful attention to quality control measures by the hospital microbiology laboratory and laboratory suppliers will minimize but not eliminate this problem. Constant vigilance by infection control personnel working in concert with the microbiology laboratory provides the best means of identifying and interrupting outbreaks. Liaison with the clinical staff as well as prompt microbiologic and epidemiologic investigation are needed to prevent unnecessary antimicrobial therapy and prolonged hospitalization. This latest report of ***Bacillus*** species pseudomeningitis should serve as a constant reminder to be ever alert to yet another aspect of infection control-the pseudo-outbreak.

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