There appears to be a substantial decline in the quality of microbiology done in the context of pulmonary infections during the current era, compared with 3 decades ago, and the question posed to the medical community is whether this change is acceptable or reversible. The decline seems to be well documented. In the prepenicillin era, for example, Bullowa [1] reported his own experience with >4000 cases of pneumonia, from 80% of which S. pneumoniae was recovered. In the 1950s, most reports had a yield of pneumococci in patients hospitalized with community-acquired pneumonia of 40%–70%. During the past 15 years, it has been a challenge to find any US-based study in which the yield of pneumococci was >18%. The experience at Johns Hopkins Hospital (Baltimore, MD) reflects these trends: the yield of S. pneumoniae from Gram staining and culture of sputum samples in cases of community-acquired pneumonia in 1970 was 60% [2]; in 1980, it was 40% [3]; and in 1991, it was 18% [4]. The conclusion from these reports is that either the pneumococcus is disappearing or microbiology is disappearing.

Some would argue that other microbes have become far more prominent and thus fill the void, but this argument is weakened by the fact that few studies identify any likely pathogen in 50%–70% of cases.

I queried Robert Fekety (University of Michigan) on his explanation for the 60% yield of S. pneumoniae in 1970, compared with the 18% yield in 1991 at the same hospital, and his response was not surprising: the difference was attributed to a dramatic change in emphasis on microbial detection. The previous era was characterized by house staff laboratories in every ward, and house staff and attending physicians often spent long periods performing a diagnostic examination of the expectorated sputum specimen, which had been obtained with great care and plated for prompt incubation in incubators on the ward. Therapeutic decisions were generally based on these results.

During the past 30 years, there has been a notable decline in the quality of this exercise. Some of this decline can be ascribed to the Clinical Laboratory Improvement Amendments of 1988, which required that staff have credentials to interpret Gram stains of any specimens, thus essentially eliminating the house staff laboratory. Additional factors in the decline of microbiology were the outsourcing of specimens, which led to delays in processing and poor communication between the microbiologist and the physician. There were also the economic pressures to reduce cost: the chemistry laboratory became highly efficient because of technological advances, but the microbiology laboratory continued to depend on labor-intensive practices developed by Robert Koch in the 19th century.

Some would argue that this transition simply reflects the current climate in medicine and has been accomplished with minimal loss. It can be argued correctly, for example, that microbial studies usually have a low yield even when there is an exhaustive search for every conceivable pathogen. There is also the lack of documented benefit in terms of reduced cost or better outcome. Perhaps most important is the apparent effectiveness of antibiotics that are selected empirically. One of our colleagues summarized his approach as follows:

If my patient appears to have pneumococcal pneumonia, I generally pick a fluoroquinolone, since this seems to be best drug at the present time. If the patient does not have pneumococcal pneumonia, I usually pick a fluoroquinolone, because that seems to be the most reliably active drug against the other diagnostic possibilities.

It has also been argued that even detection of S. pneumoniae in blood cultures does not exclude the possibility of a copathogen, a new and somewhat novel concept of pulmonary infections that would nullify...
any attempt at pathogen-directed prescribing practices. Thus, one asks: Are we at a juncture at which routine microbiological studies are no longer useful for pulmonary infections, and have we reached the point at which high-quality microbiological study results can no longer be achieved?

This issue of Clinical Infectious Diseases includes a review by Musher et al. [5] that addresses the issue of use of Gram staining and cultures of sputum samples for patients with bacteremic pneumococcal pneumonia. Their retrospective review showed that patients who could provide an expectorated sputum specimen had yields of pneumococcus of 57% and 79% for Gram staining and culture, respectively; for patients treated with antibiotics for <24 h, the yields were 63% and 86%, respectively. Was this an experience that was idiosyncratic to the Houston Veterans Affairs Medical Center? Were these cases in which Musher and his colleagues personally reviewed the slides to make the expert interpretation? Was there a special process by which the specimens had expeditious transport from the ward to the laboratory, funded by a research grant, to assure consistency and reproducibility for the purpose of this review and report? The answer to all questions is no; this was simply a retrospective review of the performance of the hospital laboratory and the expertise of the microbiology technicians. The routine process included cytologic analysis and attention in interpretation paid to the decreased yield after antibiotic treatment, 2 of the most important quality-control issues in this process. Thus, a conclusion is that, in the circumstances of the Houston Veterans Affairs Medical Center, which are probably not significantly different from those at other hospital laboratories, a relatively high yield can be achieved with routine Gram staining and culture of expectorated sputum samples, provided that there is a reasonable quality assurance in processing the samples and interpreting the results. Limitations that might be acknowledged are the inability to extend these conclusions to any bacterial pathogen other than S. pneumoniae or to pneumococcal infections not associated with bacteremia.

In more recent years, a urinary antigen assay (Binax NOW) for the detection of S. pneumoniae pneumonia was introduced. One of the obvious questions that confront clinicians and microbiologists is that of the relative merits of this new assay, compared with those of the traditional Gram staining and culture studies. In a prior report that was somewhat analogous to the article by Musher et al. [5], Smith et al. [6] compared the yield of positive results obtained with the pneumococcal urinary antigen assay for 107 adults with bacteremic pneumococcal pneumonia with the yield for 106 control patients with bacteremia involving other pathogens. The sensitivity of the urinary antigen assay was 82%, and the specificity was 97%. Others have reported similar results, showing that the urinary antigen assay was as good as or somewhat better than conventional microbiological studies [7]. There are at least 3 reasons that this test is now attractive: (1) the sensitivity and specificity appear to be as good as those for conventional Gram staining and culture for adults (but not for children), (2) the test results are valid after antibiotics are given, and (3) the current pressure to deliver antibiotics ≤4 h after registration in the emergency department to comply with anticipated Medicare performance standards may make this more realistic when considering the logistics required for conventional microbiological studies in busy emergency departments. Two reasons that conventional microbiological studies may be preferred are (1) the expense of the reagents, which is approximately $30.00 per specimen for the urinary antigen test; and (2) the lack of a microscope for sensitivity testing, which, for many persons, may be the most important issue, both for individual patient treatment and for the determination of population-based information. In many cases, health care providers may consider these tests complementary and recommend both [7].

Some view the decline of microbiological studies summarized above to be a sign of the times, but others consider it disturbing in the context of both individual patient treatment and the determination of population-based information. We may now be entering into an era when the priority of microbiological examinations for pulmonary infections substantially increases, which could not be predicted several years ago. This is stated in reference to recent events that emphasize the potential importance of good microbiological studies in the context of several infections that deserve particular attention because of their importance in epidemiology and management. Examples are severe acute respiratory syndrome, influenza H5N1, inhalation anthrax, necrotizing pneumonia due to community-acquired methicillin-resistant S. aureus, and Legionella infection. All of these require an unconventional approach to therapy and/or an epidemiologic investigation that may have a riveting regional or national impact. The report by Musher et al. [5] should help get us back on track.

Acknowledgment

Conflict of interest. J.G.B. is an HIV consultant for Bristol-Myers Squibb.

References

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