

Letters to the Editor

Isolation Rooms for TB Control

To the Editor:

In their article "Isolation Rooms for Tuberculosis Control" (1993;14:619-622) Nicas et al appear to endorse the California Department of Health Service's recommendation for the routine use of high-efficiency particulate air (HEPA)-filter respirators and, in some circumstances, the use of powered air-purifying respirators with HEPA-filters. Compared with surgical masks, these devices reduce face-seal leakage by 50% to 90%, respectively, and filter leakage by more than 99%.¹ They note that such devices are cumbersome, may frighten and alienate patients, and may interfere with healthcare delivery. Still, they state, "These arguments... do not justify allowing healthcare workers to avoid using proper protective equipment" (emphasis added).

Current focus on the use of complex and expensive HEPA-filter devices for protection against acquisition of tuberculosis (TB) is prompted by the recent spate of institutional outbreaks of TB in New York, Florida, and elsewhere. Yet analysis of the factors contributing to these outbreaks generally revealed such basic errors as failure to consider TB in the differential diagnosis, delayed initiation and inadequate duration of TB isolation, inadequate isolation room ventilation, and lapses in standard respiratory isolation practices.⁷

HEPA-filter masks will not serve to prevent nosocomial transmission of TB if the diagnosis is not entertained and if respiratory precautions are not instituted in the first place. Although fitted HEPA-filter respirators undoubtedly can reduce further droplet nuclei exposure, their incremental benefit in preventing TB could be marginal in situations in which the other, more

basic features of respiratory isolation are initiated early and maintained appropriately. The authors' contention that only advanced-design respirators constitute "proper protective equipment" requires clinical validation before these costly and intrusive devices can be recommended for routine use.

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REFERENCE

1. Centers for Disease Control and Prevention. Guidelines for preventing the transmission of tuberculosis in health-care facilities, second edition. *Federal Register* 1993;58:52810-52854.

The authors reply.

We appreciate the points raised by Dr. Mintz in his letter because these issues are of considerable concern to both infection control and occupational health practitioners alike. While the focus of our editorial was the design and testing of isolation rooms for tuberculosis (TB) patients, we also recommended the use of high-efficiency particulate air (HEPA)-filter respirators by healthcare workers, including the use of powered air-purifying respirators during cough-inducing procedures unless adequate source control measures are in place.

We concur that a TB control program must include fundamental elements, such as the rapid identification and adequate respiratory isolation of patients suspected to have TB, as well as the appropriate use of respiratory protection by healthcare workers. We do not recommend that all healthcare workers wear respirators at all times or when attending all patients. Rather, in specific situations (identified as part of a risk assessment conducted by each facility) healthcare workers should wear HEPA-filter respirators as

minimum protection. Because the issues involved in using respirators are complex and deserve a thoughtful but lengthy discussion, we plan to submit an article providing the rationale for this recommendation at a later date. In brief, we believe that the increment in protection afforded by HEPA-filter respirators is substantial. While disposable HEPA-filter respirators are more expensive than disposable dust-mist respirators, reusable ones are comparable in cost and justify overcoming problems to gain acceptance.

Dr. Mintz notes that numerous nosocomial TB outbreaks apparently involved breaks in standard TB infection control measures and improper functioning of isolation rooms. However, to our knowledge, none of these investigations have addressed directly the contribution of respirators in reducing occupational TB transmission. Although transmission reportedly has decreased in outbreak areas of hospitals following implementation of TB control measures, we believe the observation period too short and the number of workers monitored too few to draw reliable conclusions about the relative efficacy of the control measures, including respiratory protection. In our view, it has not been established clearly that the use of disposable dust-mist respirators has reduced occupational TB transmission adequately in these settings. Given the excessive penetration of disposable dust-mist respirators, routine use of these respirators should not be recommended for protection against TB aerosols.

While clinical validation studies are desirable, it probably will be difficult to isolate the effect of any one control measure (eg, use of a particular type of respirator) in reducing occupational TB transmission. Until such studies can demonstrate reliably the efficacy of a particular type of respira-

tor in reducing TB infection rates, we think it prudent to recommend HEPA-filter respirators based on the physical behavior of TB droplet nuclei and the effectiveness of these respirators in reducing inhalation exposure to particles in this size range.

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To the Editor:

In their commentary on isolation rooms for tuberculosis control, Nicas et al (1993;14:619-622) have framed appropriately the discussion on the occupational hazards of tuberculosis (TB) in healthcare settings. Specifically, I agree that we need to answer two principal questions: What is an acceptable risk of *Mycobacterium tuberculosis* infection for healthcare workers? And on what evidence should TB control programs be based? (Possibly, a third question, relevant not only in developed countries but, more importantly, in developing countries where occupational TB is a much more substantial risk, is what resources are we as a society willing to invest to reduce occupational TB risks?)

I disagree with their answers to both of the questions. They recommend an annual occupational risk of *M tuberculosis* infection of 0.01%. This, they say, is analogous to similar risks judged acceptable for occupational carcinogenesis. The risk level that they proposed would appear to be substantially more rigorous than is currently in place for occupational needlestick injuries. I think any survey of healthcare workers almost certainly would suggest that disease transmission by needle injury is viewed by healthcare workers as being much more important to them than that of TB. Second, there obviously is a differ-

ence between the risks of potentially fatal occupational cancers and the readily treatable outcome of clinical TB. Finally, the use of *M tuberculosis* infection as the outcome measurement ignores the clinical fact that only 10% or fewer of infected individuals will develop clinical TB over their lifetime¹; thus, 90% of the individuals who develop the outcome of interest will never have any clinical effect of this outcome. Surely, these clinical data should be used to increase the annual acceptable risk at least by an order of magnitude.

Nicas et al propose an answer to the second question that physical science principles should be employed when developing TB control programs. They suggest that, if droplet nuclei have aerodynamic diameters of 1 to 5 microns, then physical apparatuses that will capture such droplet nuclei efficiently would be used reasonably to reduce the hazards of occupational TB. I suggest, on the other hand, that the level of evidence for occupational protection of healthcare workers should be analogous to that used elsewhere in clinical medicine for therapeutic interventions? and that evidence based on efficacy ("can it work") really is inadequate for any level of decision-making. A more relevant standard would be effectiveness ("does it work"). I am concerned that many of the standards being suggested for occupational TB control are based on efficacy data alone. These would include not only disposable dust/mist filter respirators, but also particulate respirator devices and ultraviolet light. There is no evidence that these devices, when implemented on top of more established control measures, such as the identification of infectious patients, early institution of antituberculous chemotherapy, and air handling controls, will produce an added benefit in reducing TB hazards to healthcare workers.

In my own institution, almost

every instance of occupational acquisition of *M tuberculosis* infection can be attributed to failure to diagnose an infectious patient. Consequently, the elaborate (and expensive) additional precautions being proposed likely would have almost no impact on the well-being of our workers unless they were applied universally. We probably would produce more effective use of scarce resources by emphasizing through policies, programs, and educational efforts the importance of early diagnosis. Others may find that resources spent on patient follow-up and directly observed therapy would have the greatest impact on reducing occupational risks. What is needed is clinical trial evidence that proposed control measures will reduce the risk of developing a clinically relevant outcome.

In hospital infection control, we have made a great deal of use of standards, national and otherwise, in guiding our practices. We would do well, however, to remember the words of the physician-playwright Anton Chekov, who once noted, "There is no national science just as there is no national multiplication table; what is national is no longer science."

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REFERENCES

1. Des Prez RM, Heim CR. *Mycobacterium tuberculosis*. In: Mandell GL, Douglas RG, Bennett JE, eds. *Principles and Practice of Infectious Diseases*. New York, NY: Churchill Livingstone; 1990:1877-1906.
2. Sackett DL, Haynes RB, Guyatt GH, Tugwell P. *Clinical Epidemiology: A Basic Science for Clinical Medicine*. 2nd ed. Boston, MA: Little Brown and Co; 1991:187-248.

The authors were given the opportunity to reply to Dr. Taylor's letter but have chosen to respond at a later time.