Engineering Controls for Tuberculosis: Upper-Room Ultraviolet Germicidal Irradiation Guidelines

Charge to Reviewers

Dear :

Enclosed for your review and comment is the draft National Institute for Occupational Safety and Health (NIOSH) technical document *Engineering Controls for Tuberculosis: Upper-Air Ultraviolet Germicidal Irradiation.* The draft document was developed by an interdivisional team of NIOSH scientists. It contains guidelines for designing safe and effective upper-air ultraviolet germicidal irradiation (UVGI) systems that will kill or inactivate droplet nuclei containing *Mycobacterium tuberculosis.*

In 1997, NIOSH awarded a contract to the University of Colorado to evaluate the ability of a well-designed and thoroughly characterized upper-air ultraviolet UVGI system to inactivate or kill airborne surrogates of *M. tuberculosis.* A number of parameters were evaluated during the study. These included: (1) the intensity of UVGI needed to inactivate *M. tuberculosis* surrogates, (2) how to best measure UVGI irradiance levels, (3) the effect of air mixing on UVGI performance, (4) the relationship between mechanical ventilation and UVGI systems, (5) the effects of humidity and photoreactivation, and (6) the optimum placement of UVGI fixtures.

The completed research clearly indicates that an appropriately designed and maintained upper-air UVGI system can inactivate or kill airborne mycobacteria and significantly increase the protection afforded to healthcare workers while **maintaining a safe level of UVGI in the occupied lower portion of the room.** The information obtained from this research has been combined with data from other studies to develop the guidelines.

During your review, please address the technical content only as the document will be edited after external review comments have been considered and incorporated into the document. The following is a list of specific and general questions for you to consider:

<u>Specific Questions</u>

1. Is the guideline provided for average UVGI intensity (30-50μW/cm^2) in the upper-room air appropriate? Would it be better to use a minimum average intensity (e.g., 30 μW/cm^2)? Would some other guideline be more useful?

2. Is the guideline for installing louvered fixtures that provide 0.17 UV-C watts per each ft^2 in a room appropriate? Is the guideline of 0.085 UV-C watts per ft^2 for fixtures without louvers in rooms with 9 ft or higher ceilings appropriate?

3. Other than the information provided in the draft document, what other methods are available for obtaining "spot measurements" of the upper-air UVGI intensity when the UVGI system is composed of multiple fixtures?

4. Is it appropriate to provide a guideline that states UV lamps should be replaced when the lamps start to emit approximately 70% of their original output? What is the best way to measure the output of the UV lamps in a fixture?

5. Under "air mixing guidelines" it is stated in the draft that fans should be used to continually mix the air if there is any question about vertical air mixing between the upper and lower portion of a room. Will the use of mixing fans have any affect on other infection control issues?

General Questions

1. Is the information presented adequate? If not, what further information should be provided? What additional tables or graphs would you suggest?

2. What information, if any, would you delete and why?

3. Has all of the relevant information been considered for the topic(s)? If you believe other citations should be included for completeness, please identify and provide a copy of the reference(s).

Your review comments may be disclosed to outside parties if NIOSH is requested to provide this information under a Freedom of Information Act (FOIA) request.

Please return your comments to Mr. Larry Reed by , at MS R5. If you have any questions concerning this document, feel free to contact Mr. Reed at (513) 841-4592, fax (513) 841-4506, or e-mail ler3@cdc.gov.

Thank you for agreeing to participate in the external review of this document.

Sincerely yours,

Mary Lynn Woebkenberg, Ph.D.
Interim Director
Division of Applied Research and Technology

Enclosure