neously judged their likelihood of contracting SARS based on their experience with colleagues who contracted SARS and their previous occupational exposure to infectious agents. The availability heuristic[17] refers to the common human tendency to judge the likelihood of events in terms of how readily instances come to mind. Thus, physicians who are familiar with an infected colleague may perceive greater risk because the possibility of contagion is personally salient. Alternatively, an optimistic bias may also explain the findings, given that physicians rated their health status highly, and only slightly more than half reported previous occupational exposure to any infectious agent. Undoubtedly, all physicians would have had some personal exposure to infectious agents during training or practice, so responses to this question were presumably based on personal exposure to serious infections that readily came to mind.

The main limitation of this study pertains to the response rate, although our rate is similar to that of other reported physician surveys.[18] The generalizability of our findings to nonresponders, non-academic physicians, or those in other reimbursement systems is unknown.

Despite the increased risk among HCWs of contracting SARS, these highly trained academic physicians generally perceived a low personal risk of infection. Similar to lay populations, their risk perception was more strongly related to personally salient examples than to scientific evidence. Future study is required to understand the constellation of cognitive and affective factors at play. The relationship among risk perception, willingness to treat infectious patients, and infection control practices should also be investigated.

The authors are from the University Health Network Women's Health Program, Toronto, Ontario, Canada. Ms. Hershenfield and Dr. Stewart are also from the University of Toronto, Toronto, Ontario, Canada. Dr. Grace is also from York University, Toronto, Ontario, Canada.

Address reprint requests to Sherry L. Grace, PhD, Assistant Professor, York University, Kinesiology and Health Sciences, Affiliated Scientist, Toronto General Research Institute, Toronto, Ontario, Canada.

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A Large-Volume Nebulizer Would Not Be an Infectious Source for Severe Acute Respiratory Syndrome

Gwo-Hwa Wan, PhD; Ying-Huang Tsai, MD; Yao-Kuang Wu, MD; Kuo-Chien Tsao, MSc

ABSTRACT

We attempted to detect the presence of airborne SARS-coronavirus (CoV) in a healthcare setting when a patient with SARS used a humidifier or a large-volume nebulizer (LVN). All of the air samples from the humidifier and LVN were found to have negative SARS-CoV–specific DNA products (*Infect Control Hosp Epidemiol* 2004;25:1113-1115).

Severe acute respiratory syndrome (SARS) is a recently emergent disease that started in Asia and spread to other continents through international travel.[1] Patients infected with SARS coronavirus (CoV) have fever, dry cough, dyspnea, headache, and hypoxemia. Death may result from progressive respiratory failure due to alveolar damage.[2]

The SARS-CoV may be carried in droplets produced by aerosolization that can occur as a result of coughing or talking.[3] In primary clinical therapy, SARS patients were treated with oxygen therapy combined with humidification using a humidifier or a large-volume nebulizer. Until recently, no studies had confirmed whether a large-volume nebulizer was a risk factor for SARS transmission in a healthcare setting. Therefore, we specifically evaluated airborne SARS-CoV DNA concentrations using filter sampling and SARS-CoV–specific reverse transcriptase polymerase chain reaction (RT-PCR) assay when a SARS patient was treated with a humidifier or a large-volume nebulizer.

METHODS

Subjects

A patient with the diagnosis of SARS confirmed by symptoms, chest radiograph, throat swab, and nasopha-

TABLE 1
DISTRIBUTIONS OF AIRBORNE SEVERE ACUTE RESPIRATORY SYNDROME (SARS)–CORONAVIRUS WHEN THE SARS PATIENT USED A HUMIDIFIER OR A LARGE-VOLUME NEBULIZER

	Device		
		Large-Volume	
	Humidifier	Nebulizer	Blank
Sample size	3	3	6
Sampling filter	PTFE	PTFE	PTFE
Pore size of filters	1 μm	1 μm	1 μm
Positive PCR results	0%	0%	0%

PTFE = polytetrafluoroethylene; PCR = polymerase chain reaction.

TABLE 2
POSITIVE RATES OF DIFFERENT FILTERS ON POLYMERASE CHAIN REACTION (PCR)

	Sampling Filter		
	PTFE (1 μm)	PTFE (0.2 μm)	PC (0.2 μm)
Sample size	3	3	3
Positive PCR results	100%	100%	100%
Positive blank PCR results	0%	0%	0%

PTFE = polytetrafluoroethylene; PC = polycarbonate.

ryngeal aspirates on May 12, 2003, was recruited from a negative pressure isolation room at Chang Gung Memorial Hospital. After informed consent was obtained from interview, air samples were collected from a patient isolation room.

Environmental Sampling

When the SARS patient was treated with oxygen therapy by means of a bubble diffuser humidifier or a large-volume nebulizer, a three-piece cassette with a 1-μm polytetrafluoroethylene (PTFE) filter was placed approximately 30 cm above the patient's head, thus simulating the human breathing zone. The indoor air was filtered at a flow rate of 4.5 L/min for 20 minutes. Sample controls of the environment were also taken. All of the staff involved in collecting the air samples in a negative pressure isolation room were advised to wear full personal protective equipment (such as N-95 respirators, eye protection, and disposable fluid-resistant gowns and gloves) for protection against SARS.

Aerosol Generation

To evaluate the filtration efficiency of 1- or 0.2-μm PTFE and 0.2-μm polycarbonate filters for airborne SARS-CoV, we generated a SARS-CoV virucidal spray with a small-volume nebulizer (Whisper Jet, Marquest Medical Products, Englewood, CO). Three different filters (1- and 0.2-μm PTFE filters and a 0.2-μm polycarbonate filter) were used to collect air samples at 4.5 L/min for 20 minutes.

Analysis

The filters were shaken in AVL buffer containing carrier RNA (QIAamp Viral RNA Mini Kit, Qiagen, Valencia, CA) and phosphate buffered saline for 20 minutes at room temperature. For extracting the RNA from the filter samples, we used the QIAamp Viral RNA Mini Kit (Qiagen) and followed the manufacturer's protocol. Following extraction, the viral RNA was quantitatively measured using a real-time RT-PCR method, as per the protocol from Taiwan's Center for Disease Control and Prevention.[4]

RESULTS

In this study, the patient was confirmed to have SARS after environmental sampling in the negative pressure isolation room. None of the environmental samples revealed any positive SARS-CoV–specific DNA products when the patient was treated with oxygen therapy by a humidifier and a large-volume nebulizer, respectively (Table 1). It was demonstrated that the PCR positive rates of the filters (1- and 0.2-μm PTFE filter and 0.2-μm polycarbonate filter) were 100% (Table 2).

DISCUSSION

In 2003, SARS became a subject of concern to healthcare workers and to the public in general throughout the world. Previous studies have shown that aerosolized rhinovirus, concentrated on PTFE filters with a 2-μm pore, was detected by a semi-nested RT-PCR assay.[5] We attempted to collect SARS-CoV aerosols of high concentration from a small-volume nebulizer using different filters. The PCR positive rates for 0.2- and 1-μm PTFE filters and 0.2-μm polycarbonate filters were 100%. Therefore, these filters may be suitable for environmental sampling of the SARS-CoV.

This study demonstrated that all negative airborne SARS-CoV PCR runs were obtained from 1-μm PTFE filters in the patient's room while the patient was being treated with either a humidifier or a large-volume nebulizer. These negative PCR runs for a large-volume nebulizer for airborne SARS-CoV do not correspond with the general perception that a nebulizer, because it produces aerosols, might be a transmitting source for SARS in hospitals. However, PTFE filters were shown not to yield positive PCR runs from the large-volume nebulizer. One explanation might be related to the possibility that there is an extremely low existence of airborne SARS-CoV. Moreover, the current study included only one patient.

To date, no previous studies have addressed the characteristics of airborne SARS-CoV in a healthcare setting. Therefore, we evaluated the distributions of airborne SARS-CoV in patient rooms in a hospital when a SARS patient was being treated with oxygen therapy combined

with a humidifier and a large-volume nebulizer. PCR amplification of the air samples in this patient isolation room detected 0% of the offending pathogens. It demonstrated that a large-volume nebulizer perhaps would not be a risk factor for SARS transmission.

Dr. Wan is from the Department of Respiratory Care, College of Medicine, Chang Gung University, Taiwan, Republic of China. Drs. Tsai and Wu are from the Department of Pulmonary and Critical Care and Ms. Tsao is from the Department of Clinical Pathology, Chang Gung Memorial Hospital, Taiwan, Republic of China.

Address reprint requests to Ying-Huang Tsai, Department of Pulmonary and Critical Care, Chang Gung Memorial Hospital, 5, Fu-Shing St., Kwei-San, Tao-Yuan, Taiwan, Republic of China.

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Transmission of Tuberculosis Among Patients With Human Immunodeficiency Virus at a University Hospital in Brazil

Mariângela R. Resende, MD, PhD; Maria Cecília B. Villares, BS, PhD; Marcelo de C. Ramos, MD, PhD

ABSTRACT

This study evaluated the IS*6110*-RFLP patterns of 109 *Mycobacterium tuberculosis* isolates of patients with HIV cared for at a Brazilian university hospital. Thirteen clusters involving 35 (32.1%) individuals were identified. Nosocomial transmission was possible in 5 cases. Strategies to prevent *M. tuberculosis* transmission should be implemented in hospitals in developing countries (*Infect Control Hosp Epidemiol* 2004;25:1115-1117).

Co-infection with human immunodeficiency virus (HIV) is the greatest risk factor for both progression of primary tuberculosis (TB) on recent exposure and reactivation of latent infection.[1] Admission of patients co-infected with *Mycobacterium tuberculosis* and HIV to healthcare facilities is often associated with delayed isolation precautions, diagnosis, and treatment, which may contribute to the spread of *M. tuberculosis* and trigger outbreaks.[2] TB was the second most common opportunistic infection among the 157,775 patients with acquired immunodeficiency syndrome (AIDS) reported in Brazil from 1980 to 1999.[3] TB and HIV co-infection leads to a larger number of hospital admissions. In Brazil, as in other developing countries, the transmission of TB has not been well characterized by molecular methods.

This study was performed to evaluate patterns of TB transmission among HIV-infected patients cared for at a Brazilian referral hospital, using conventional epidemiology and IS*6110* restriction fragment length polymorphism (RFLP) molecular fingerprinting.

METHODS

Setting

This study was performed at the university teaching hospital of the Universidade Estadual de Campinas (HC-UNICAMP), São Paulo, Brazil. This is a 400-bed, tertiary-care facility and regional referral center for HIV care. During the past decade, an average of 288 new TB cases per year were reported to the Epidemiologic Surveillance Office at the hospital. Transmission-based precautions, consisting of private rooms (without negative pressure) and the use of N-95 respirators by the hospital staff, were implemented in 1996. These precautions were applied to all patients presenting respiratory symptoms, such as cough, shortness of breath, and chest pain, for more than 2 weeks until a definitive diagnosis was made. No additional precautions were adopted for HIV-positive patients.

Design

A retrospective, conventional, and molecular-based epidemiologic study was performed among hospital inpatients and outpatients.

Study Population

A case-patient was defined as an HIV-positive patient with a culture positive for *M. tuberculosis* reported to the Epidemiologic Surveillance Office at HC-UNICAMP from January 1996 to July 2001. Exclusion criteria were nonbanked *M. tuberculosis* isolates, cases of probable laboratory cross-contamination, and recurrent TB episodes in the same patient. Laboratory cross-contamination was suspected when the patient's clinical presentation was not consistent with TB and the specimen had been processed concomitantly with another isolate exhibiting an identical IS*6110*-RFLP pattern. Demographic, epidemiologic, and clinical variables were collected from medical records. This study was reviewed and approved by the Medical Ethics Committee of the university.

Molecular Strain Typing

One *M. tuberculosis* isolate from each enrolled patient was submitted for fingerprinting using IS*6110*-RFLP according to standard protocols.[4] IS*6110*-RFLP patterns were compared visually and by Gel Compar computer software (version 4.0; Applied Maths, Kortrijk, Belgium). Isolates were considered to be clustered if they had five or more IS*6110* bands and identical patterns. Statistical analysis was performed using Epi-Info software