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24 MARCH: WORLD TUBERCULOSIS DAY

*On 24 March, 1880, Dr. Robert Koch presented the first paper on **Mycobacterium tuberculosis**. Because of the current urgent world situation with respect to tuberculosis, the World Health Organization has declared 24 March as World Tuberculosis Day. Several important documents are being released as part of Canada's participation in this day. Health Canada is releasing the "Guidelines for Preventing the Transmission of Tuberculosis in Canadian Health Care Facilities and Other Institutional Settings" (copy included with this issue) and the Canadian Lung Association has just released the fourth revision of the "Canadian Tuberculosis Standards".*

EVIDENCE FOR TB CLUSTERING IN VANCOUVER: RESULTS FROM PILOT STUDY USING RFLP FINGERPRINTING

Restriction fragment length polymorphism (RFLP) analysis is now being used in conjunction with traditional epidemiologic techniques to further define the epidemiology of tuberculosis (TB)[1,2,3]. Cluster analysis suggests that 30% to 40% of new cases of TB in urban centres in the United States are due to recent transmission[1,2]. As part of a pilot project, we reviewed a sample of isolates available from an analysis of cases diagnosed in Vancouver between October 1992 and March 1994. This retrospective study was to refine methodologic issues for a larger prospective study, which we are currently undertaking in Western Canada.

Methods

All culture-positive TB cases diagnosed in the Vancouver area between October 1992 and March 1994 were identified. Of 170 cases diagnosed during this period, there were 114 isolates available. The isolates were examined using standard methodology. Cases with identical band patterns were identified as a cluster. Routine demographic data on all patients were collected from the Provincial Tuberculosis Registry, including age, sex, race, ethnicity and country of birth. Specific information regarding TB was also collected, including date of diagnosis, TB risk factors, HIV risk factors and, if known, HIV status. Cases involved in clusters were then compared with the remainder of the group.

Results

Five clusters were identified involving a total of 14 patients. Four clusters included two patients each, while the remaining cluster involved six patients. Because of the numbers involved in the smaller clusters, the analysis was confined to the large cluster.

The mean age of those in the clusters was 43.5 years [standard deviation (S.D.:16.6 years] compared with 53.5 (S.D.:19.8 years) in the rest of the cases. There was no significant difference in gender distribution or proportion deceased between the two groups. Data regarding intravenous (IV) drug use and HIV status were inconsistent and, therefore, could not be analyzed systematically. A significant difference in ethnicity was found when the numbers of Caucasians, Aboriginal Canadians, Chinese, and others were compared between the two groups. This reflects the fact that of the 14 subjects identified in the clusters, six were Aboriginal Canadians.

The largest cluster, and most interesting from an epidemiologic point of view, included six individuals, one of whom was an HIV-infected health care worker. The gel electrophoresis pattern for this group is shown in Figure 1. The other five individuals were in contact through a common hotel in downtown Vancouver. Characteristics of these patients are shown in Table 1. Four of the subjects reported substance abuse and a fifth was an immigrant

Table 1
Characteristics of TB Patients in Largest Cluster Identified Using RFLP Fingerprinting in Pilot Study in Vancouver, BC

Case	Sex	Age	Ethnic Origin	TB risk factors	Date of Diagnosis	Outcome	Comment
1	F	40	Caucasian	Ethanol	4/13/93	cured	waitress at HC
2	M	46	Aboriginal	Aboriginal	5/18/93	cured	lived near HC
3	F	31	Jamaican	none known	7/19/93	dead: TB	lived at HC, new Patient 5
4	F	41	Aboriginal	Aboriginal/intravenous drug user/AIDS	9/22/93	dead: AIDS	lived in area of HC, knew Patient 5
5	M	43	Caucasian	Intravenous drug user/Ethanol	12/7/93	cured	lived at HC, knew Patients 3 and 4
6	M	40	Caucasian	HIV/VIH	1/21/94	dead: AIDS	ER nurse

M = Male
F = Female
HC = Hotel in common

from Jamaica. Apart from the one HIV-positive health care worker (Patient 6), there was an additional HIV-positive Aboriginal female who was an IV drug user (Patient 4). Patient 6 was an emergency room nurse at the hospital where patients 1, 3, 4 and 5 received treatment. Through a careful review of emergency room (ER) records, Patient 6 was identified as being on duty on 23 October, 1993, when Patient 5 was seen in the ER. Patient 5 was diagnosed with smear-positive pulmonary TB 6 weeks later. Patient 6 was diagnosed with disseminated TB on 21 January, 1994. Interestingly enough, this patient subsequently relapsed with a rifampin-resistant organism. This organism was found to be the same one as the patient had originally presented with when typed by RFLP analysis.

Discussion

This small pilot study shows that clustering of TB cases is occurring in Vancouver in a similar manner to that which has been described in larger studies in urban centres in the United States.

Although the data are limited by the fact that it is a pilot study, it highlights the important ethical issue with regard to HIV-positive health care workers and their potential exposure to individuals with active TB. It also indicates that, although in general, HIV-related TB has not been a major problem in Canada, (although more recently there has been a significant change in this trend[4]) in the context of a community setting, the presence of even a small number of undiagnosed TB cases has the potential for significant transmission of the infection to both HIV-infected and non-HIV-infected community workers and patients.

The study emphasizes the need for careful surveillance using molecular, epidemiologic techniques to better define our current TB control measures, particularly in inner city populations at risk of HIV infection and living under poorer socioeconomic conditions. It also highlights the need for control measures and surveillance in community settings[5]. Although guidelines for infection control in institutional settings have been defined[6], levels of surveillance for community groups, in particular where HIV-infected individuals reside, need to be better defined.

It is hoped that our current prospective study, which is systematically evaluating all isolates, will better define the extent of clustering in a Canadian context and allow for improved TB surveillance programs to be implemented.

Figure 1
Gel electrophoresis pattern of six identical isolates among the cluster of Vancouver cases

Figure not included in this electronic copy.

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Source: *M Blenkush, MD, Respiratory Division, University of British Columbia, Vancouver; D Kunimoto, MD, FRCPC, Division of Infectious Diseases, University of Alberta, Edmonton; W Black, MB, FRCPC, Division of Infectious Tuberculosis Control, B.C. Centre for Disease Control (BCCDC), Vancouver; RK Elwood, MD, FRCPC and JM FitzGerald, MB, FRCPC, Division of Tuberculosis Control, BCCDC and Respiratory Division, University of British Columbia, Vancouver, British Columbia.*

NATIONAL SURVEILLANCE OF OCCUPATIONAL EXPOSURE TO THE HUMAN IMMUNODEFICIENCY VIRUS

Protocol

The National Surveillance of Occupational Exposure to the Human Immunodeficiency Virus (HIV) has been ongoing since September 1985. Participation in the study is voluntary and all workers who are occupationally exposed to a person infected with HIV are eligible for entry provided that they meet the protocol criteria. To be included in the study, workers must have sustained a documented parenteral, mucous-membrane or non-intact skin exposure to HIV-infected blood or body fluids.

The study was initiated to monitor the occurrence of occupational exposures to HIV-infected blood and body fluids among health care workers and to determine the risk of acquiring HIV infection as a result of documented exposures to the virus. The surveillance protocol requires that participants have HIV serology tests done (ELISA) within one week of the occupational exposure to provide baseline data. Blood will then be collected 6 weeks post-exposure, 12 weeks post-exposure, and 6 months post-exposure, for a total of four specimens over the 6-month period. Initially, the follow-up period was 12 months but this is no longer required since virtually all seroconversions occur within 6 months. All incident reports, serology results and related documents are coded to ensure confidentiality and no personal identifiers are required.

Participants have the option of having serum samples tested at the Laboratory Centre for Disease Control or at the Provincial Laboratories. Employee Health Services or the participants's family physician are responsible for registering the employee and for collecting blood specimens. Information on the participant's medical history, type of exposure and precautions used are submitted to the Division of HIV Epidemiology Research, Bureau of HIV/AIDS and STD, LCDC, on standard data collection forms.

Results

Table 1 provides data on the type of exposure by profession. There was a total of 626 reported exposures as of 1 January, 1996. Nurses sustained the largest number of exposures (441 or 70% of the total) and needlestick injuries were the most common exposure type (378 or 60% of total).

Table 2 presents the type of exposure according to the protective apparel worn by the worker. Thirty-eight percent (239) of the employees wore no protective apparel at the time of their

Table 1
National Surveillance of Occupational Exposure to HIV: Exposure Types by Occupational Group (as of 1 January, 1996)

	Nurse	Therapist/ Technician	Student/ Resident	Laboratory Technician	Physician	Other	Total
Needlestick	281	15	20	26	20	16	**378 (60%)**
Surgical Instrument Wound	18	0	3	6	3	5	**35** (6%)
Mucous Membrane	44	6	1	9	4	4	**68** (11%)
Skin Contact							
a) Intact	5	1	0	2	2	4	**14** (2%)
b) *Non-intact	59	5	1	12	4	7	**88** (14%)
c) Unknown	34	3	0	2	0	4	**43** (7%)
TOTAL	**441 (70%)**	**30 (5%)**	**25 (4%)**	**57 (9%)**	**33 (5%)**	**40 (7%)**	**626** (100%)

* Previous tables had a separate heading called 'Open Wound Contamination' that has now been combined with 'Non-intact Skin Contact' exposures.

Table 2
National Surveillance of Occupational Exposure to HIV: Exposure Types by Protective Apparel Worn (as of 1 January, 1996)

	Gloves Only/	Gown & Gloves	Gloves & Mask	Gloves, Gown & Mask	Gloves, Gown, Mask, & Eye Protection	Mask &/or Gown	No protection	Total
Needlestick	190	29	5	16	16	5	117	**378** (60%)
Surgical Instrument Wound	15	2	1	6	3	1	7	**35** (6%)
Mucous Membrane	21	8	4	20	4	0	11	**68** (11%)
Skin Contact								
a) Intact	0	0	1	2	0	0	11	**14** (2%)
b) *Non-intact	15	4	3	2	2	4	58	**88** (14%)
c) Unknown	3	0	2	1	0	2	35	**43** (7%)
TOTAL	**244 (38%)**	**43 (7%)**	**16 (3%)**	**47 (8%)**	**25 (4%)**	**12 (2%)**	**239 (38%)**	**626** (100%)

* Previous tables had a separate heading called 'Open Wound Contamination' that has now been combined with 'Non-intact Skin Contact' exposures.

exposure. In 66% of the non-intact skin exposures (58/88), workers wore no gloves or other protective apparel.

Table 3 shows the exposures that probably could have been prevented by adherence to the Universal Precautions (223/626 or 36% of the total). The 122 skin contact exposures could have been prevented by covering open areas of the skin before beginning the procedure. Proper handling and disposal of used needles could have prevented 101 exposures.

Conclusions

Many of the reported exposures could have been prevented by adherence to the Universal Precautions and the importance of workers being trained and complying with guidelines on infection control cannot be emphasized too strongly. There have been no seroconversions among workers enrolled in this surveillance program. However, it should be noted that enrollment is not complete, particularly in recent years. This may be, in part, due to the need to fill out national forms that may differ from those used by the particular health institution. Work is currently underway to develop a single tracking system that may serve both local and national purposes.

Table 3
National Surveillance of Occupational Exposure to HIV:
Preventable Exposures to Blood/Body Fluids
(as of 1 January, 1996)

Description of Exposure	Number of Workers	(%)
Recapping a used needle	57	25%
Improper disposal of a used needle	44	20%
*Skin Contact	122	55%
TOTAL	**223**	**100%**

* Previous tables had a separate heading called 'Open Wound Contamination' that has now been combined with 'Non-intact Skin Contact' exposures.

Source: *L Deschamps, C Archibald, MD, FRCPC, Division of HIV Epidemiology Research, Bureau of HIV/AIDS and STD, Laboratory Centre for Disease Control, Ottawa, Ontario.*

PROTOCOLS HELP PROTECT AGAINST GETTING HIV— BUT YOU HAVE TO USE THEM

A recent needlestick injury emphasizes the need for all health care providers to rigorously adhere to the Universal Precautions, which reduce the risk of occupational exposure to HIV. Sharps are hazardous and present a risk to patients and health care providers. Although the risk of seroconversion following needlestick injury involving HIV-positive body fluids is low, the potential is real with about one seroconversion for every 300 needlesticks. These protocols have been established as safe practice guidelines to minimize that risk.

The incident involved a health care provider in Lower Mainland, British Columbia, who was caring for a person with advanced HIV disease. The provider was not wearing gloves and sustained a shallow puncture wound from a small gauge (21-25) needle. There was a small amount of blood at the wound site. The provider did not seek antiretroviral treatment for HIV because the person believed the injury to be minor. Zidovudine (ZDV) is available in all B.C. hospitals for use following such incidents, but the drug, which inhibits HIV, must be taken within hours of exposure for maximum efficacy.

Two and a half weeks later, the provider experienced acute retroviral syndrome (ARS) and was HIV-positive by PCR and p24 Ag. The HIV antibody test was negative when tested a few hours after the exposure, negative at 2 weeks post-exposure, indeterminate at 5 weeks, and positive at 7 weeks. A confirmed positive antibody test result indicates the provider has been infected with HIV. There have been more than 1,000 needlestick injuries recorded in B.C. in the last 5 years, but this is the first reported seroconversion.

"The exposure seems trivial, but involves fluid from a person with late stage disease," said Dr. Michael O'Shaughnessy, Director of the B.C. Centre for Excellence in HIV/AIDS. "We know that these individuals and those undergoing acute infection and seroconversion have very high levels of HIV in their body fluids. We believe the risk of occupational acquisition to be higher with fluids that have elevated concentrations of the virus."

The Universal Precautions are available at all hospitals and the Occupational Exposure Guidelines are currently being updated and revised.

Source: *B.C. Centre for Excellence in HIV/AIDS, St. Pauls Hospital, Vancouver, British Columbia.*

Editorial Comment

The above report is the first case of occupational transmission of HIV in Canada that can be clearly linked to a specific incident.

There have been two other cases reported in Canada that have been attributed to possible occupational transmission, both involving laboratory workers. The first case was a biochemist in Ontario who was diagnosed with AIDS in 1990 and whose only risk factor for HIV was work in the early 1980s with blood that was probably contaminated with HIV[1]. The second case of possible occupational transmission was a laboratory technician in Quebec diagnosed with HIV infection in the early 1990s and whose only known risk factor was possible exposure to cultured virus during research activities; this case is still under investigation (Dr. R. Remis, Public Health Unit, Montreal General Hospital: personal communication, 1996). Although in both cases there were numerous instances where transmission could have occurred, in neither case was a specific incident identified.

Recommendations for the prevention of HIV transmission to health workers have been developed to minimize the risk of the occupational exposure[2]. These Universal Precautions were first issued in 1987 and have since been revised several times[3-6]. The safe handling of needles and other sharp objects is especially imperative since the risk of seroconversion, although relatively low at about 0.3%[7], is, nonetheless, very real and is significantly affected by the circumstances of the exposure. The use of gloves

for venipuncture is a component of the Universal Precautions. It has been demonstrated that glove material may decrease the exposure volume by 50% or more when the needle passes through gloves before contacting skin[8]. The use of gloves may be more beneficial in situations where the injury is minor, as was the case in this unfortunate incident in BC.

Information on the efficacy of post-exposure use of zidovudine (ZDV) has not been sufficient to either recommend or discourage its use as part of the exposure protocol in Canada[9] or the United States[10]. The decision to use ZDV is left to the discretion of the patient and the treating physician, taking into consideration the details of the exposure and the uncertain efficacy and side effects of ZDV. If it is to be used, then it should be started as soon as possible after exposure, preferably within hours[10,11]. A number of centres with extensive experience in the area of occupational exposure, for example the San Francisco General Hospital, encourage the use of ZDV for massive and definite parenteral exposures and for probable exposures if the source patient has AIDS[11,12].

A recent case-control study summarized in MMWR[13] identified three factors associated with seroconversion among occupational exposures to HIV: a group of variables related to volume of blood injected (deep injury, procedure involving needle placed directly into source patient's vein or artery, visible contamination of sharp with patient's blood); terminal HIV illness in source patient; and non-use of ZDV post-exposure prophylaxis. The BC case did not involve a large volume of injected blood, but did involve a source patient with advanced HIV disease and the non-use of ZDV. Certainly, any injury involving patients with advanced HIV disease should be taken very seriously, given the high levels of circulating virus. Although the evidence from this case-control study supporting the efficacy of ZDV for post-exposure prophylaxis is not definitive, it is very encouraging.

The Division of HIV Epidemiology Research and the Division of Nosocomial and Occupational Infections at the Laboratory Centre for Disease Control, Health Canada, jointly hosted a workshop in March 1996 to review this and other information to assess the possible need to modify current recommendations for the management of occupational exposure to HIV, with special reference to the use of ZDV.

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