family members or visitors. No correlation was found between isolates recovered from routine surveillance cultures done for patients and isolates found to be colonizing or contaminating patients' family members or visitors.

The duration of family visits in our ICU (3 or more hours per day) is no shorter than the visiting times reported in other countries.[5,7,8] In addition, 18 of 33 patients had a length of stay of 15 days or more. Thus, limited exposure time is not a good explanation for the lack of correlation between isolates recovered from patients and isolates recovered from their respective family members and visitors.

Hand washing is recommended as the most effective means to prevent transmission by direct contact, because it reduces the concentration of contaminants on the skin.[9] We did detect contamination with *A. baumanii* on the hands of visitors prior to hand washing at departure, an organism that was also isolated from the patients that they visited. After that, these visitors were monitored for the presence of *A. baumanii* prior to entry to the ICU and after hand washing; *A. baumanii* was not isolated again from these individuals. We believe the lack of correlation between the isolates recovered from patients and those recovered from family members may relate to our hand washing policies.

Fumagalli et al.[4] have shown that an unrestricted visitation policy, despite imposing a greater microbial burden and greater environmental contamination, does not increase the risk of infectious complications in cardiac ICU patients. Potential pathogens isolated from patients do not appear to be the same as those carried by their family members and visitors, nor does exposure to these pathogens increase the risk of infection in the ICU if appropriate hand hygiene is enforced.

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Whole-Blood Interferon-Gamma Release Assay for Baseline Tuberculosis Screening of Healthcare Workers at a Swiss University Hospital

To the Editor—In countries with low tuberculosis incidence rates, such as Switzerland,[1] targeted testing for latent tuberculosis infection (LTBI) among risk groups such as healthcare workers (HCWs) is an important measure for preventing tuberculosis disease.[2-4] We studied the prevalence of LTBI and its risk factors among hospital employees at the University Hospital of Berne, Switzerland, in a retrospective cohort study using a whole-blood interferon-gamma release assay (IGRA).[5]

From June 1, 2005, through May 31, 2006, we screened 777 employees for tuberculosis infection with an IGRA on commencement of employment. The following data were collected for each HCW: age, sex, bacille Calmette-Guérin (BCG) vaccination status (documented or reported), country of origin, place of work, and profession. The mean age of subjects was 32 years (75% were aged 20–40 years). The majority (70.8%) of employees were female (Table). The overall BCG vaccination rate was 87.4% (90.4% among employees of Swiss origin, of whom 12.1% had multiple BCG vaccinations). The IGRA used for screening (QuantiFeron-TB Gold In-Tube assay; Cellestis) was performed according to the manufacturer's instructions.[6] Data were evaluated by univariate analysis as well as multiple logistic regression analysis. GraphPad Prism 4, version 4.01 (GraphPad Software), and StatView, version 5.0 (SAS Institute), were used for all data evaluations.

A positive IGRA result was found for 59 (7.6%) of the 777 participants (Table). Tuberculosis disease was ruled out in each case by a careful consideration of the medical history, the symptoms, and the chest X-ray findings. The overall rate of LTBI in our study population was 7.6%, which concurs with

TABLE. Results of Univariate Analysis of Risk Factors for Latent Tuberculosis (TB) Infection Among 777 Healthcare Workers (HCWs) Screened

Factor	No. (%) of all HCWs	No. (%) of HCWs with risk factor, by IGRA result: Positive ($n = 59$)	No. (%) of HCWs with risk factor, by IGRA result: Negative ($n = 718$)	Odds ratio (95% CI)	P
Age, years, mean ± SD		33.7 ± 11.1	31.6 ± 9.6	1.02 (0.99–1.04)	.10
Sex				0.81 (0.44–1.49)	.50
Female	550 (70.8)	44 (8.0)	506 (92.0)		
Male	227 (29.2)	15 (6.6)	212 (93.4)		
Country of origin, by incidence of TB[a]				3.65 (2.00–6.67)	<.001
Group A (low)	682 (87.8)	41 (6.0)	641 (94.0)		
Group B (high)	95 (12.2)	18 (18.9)	77 (81.1)		
Degree of risk of exposure to TB					
By place of work					.03[b]
Low	217 (27.9)	11 (5.0)	206 (95.0)		
Moderate	398 (51.2)	30 (7.5)	368 (92.5)	1.52 (0.74–3.11)	.24
High	162 (20.8)	18 (11.1)	144 (88.9)	2.34 (1.07–5.10)	.03
By profession					.46[d]
Low	221 (28.4)	15 (6.8)	206 (93.2)		
Moderate	198 (25.5)	14 (7.0)	184 (93.0)	1.04 (0.49–2.22)	.91
High	358 (46.1)	30 (8.4)	328 (91.6)	1.25 (0.66–2.39)	.49
Receipt of BCG vaccination					
No	63 (8.1)	6 (9.5)	57 (90.5)		
Yes	428 (55.1)	28 (6.5)	400 (93.5)	0.66 (0.26–1.67)	.39
Unknown	286 (36.8)	25 (8.7)	261 (91.3)		

NOTE. BCG, Bacille Calmette-Guérin; CI, confidence interval; IGRA, interferon-γ release assay.

[a] The cutoff for TB incidence was 10 cases per 100,000 population (see text for details). Patients in Group A originated in Germany, Switzerland, Finland, Denmark, the Netherlands, Sweden, and the United States. Patients in Group B originated in Algeria, Argentina, Austria, Bosnia and Herzegovina, Brazil, Czech Republic, Dominican Republic, Egypt, Ethiopia, Great Britain, Greece, Croatia, Hungary, India, Iran, Iraq, Japan, Republic of Korea, Sri Lanka, Luxemburg, the former Yugoslav Republic of Macedonia, Philippines, Poland, Portugal, Russian Federation, Serbia and Montenegro, Sudan, Senegal, Spain, Thailand, Tunisia, Turkey, Uruguay, Viet Nam, and Yemen.

[b] By the χ^2 test for trend.

published data for countries with an incidence of tuberculosis comparable to that of Switzerland. A recent German study[7] found positive IGRA results for 25 (9.6%) of 261 participants.

There was no association between the IGRA result and profession, age, or sex (Table). Employees were stratified for risk of LTBI into 2 groups, according to their country of origin. An annual incidence of tuberculosis disease of 10 cases per 100,000 population was chosen as the cutoff[1]; employees from a country with a higher rate were placed in group B, and all other participants were placed in group A. The IGRA positivity rate for employees from group A was 6.0%; the rate was 18.9% for employees from group B. There was a statistically significant positive association between a positive IGRA result and membership in group B (odds ratio [OR], 3.65 [95% confidence interval {CI}, 2.0–6.7]; $P < .001$).

The work place–associated risk of contracting tuberculosis was distributed as follows among the HCWs screened: low risk, 217 HCWs (27.9%); moderate risk, 398 (51.2%); high risk, 162 (20.8%) (Table). The work places considered to have a high risk were the Departments of Thoracic Surgery, Pneumology, Rheumatology, Infectious Diseases, Anesthesiology, Intensive Care, and Emergency Medicine. Nonmedical places of work, such as the laundry, the restaurant, the main office, and the administrative office, were considered to have low risk.

The high-risk category of professions was considered to comprise nurses, physiotherapists, radiographers, and members of the maintenance, cleaning, and transportation services. All other HCWs, such as medical doctors or social workers, were considered to be in the moderate-risk category. Professions without direct patient contact, such as secretaries, computer and technical specialists, scientists, pharmacists, and security staff, were considered to have low risk.

The IGRA positivity rate was 5.0% for HCWs who worked in low-risk work places, 7.5% for HCWs in moderate-risk work places, and 11.1% for HCWs in high-risk work places (Table). We detected a statistically significant trend for association of a

positive IGRA result with work in a place with a high risk (χ^2 test for trend, $P = .029$). Both the country of origin and place of work were independent risk factors associated with a positive IGRA result, according to multiple logistic regression analysis. For employees originating from a group B country, the OR was 3.65 (95% CI, 2.00–6.67); the P value was less than .001. For employees working at a place with a high risk of tuberculosis exposure, the OR was 2.34 (95% CI, 1.07–5.10); the P value was .03.

Our findings are consistent with reports by other groups. A Japanese study[8] found no association between the IGRA result and the profession of the subjects tested. An analysis of infection risk related to the place of work was not done, however. A recently published German study[9] reported an increased infection risk for HCWs engaged in geriatric care, but this study included no other hospital units. It can be argued that "place of work" is a surrogate for risk of exposure to contagious tuberculosis related to particular patient populations, whereas "profession" represents the intensity of contact during patient care. Since infectious tuberculosis is highly contagious, the latter may not be as important as the risk of being exposed at all. The place of work therefore seems to be a better surrogate than profession for the risk of contracting tuberculosis infection. In contrast to our study, both the Japanese and the German studies[8,9] reported a strong association between a positive IGRA result and increasing age among HCWs. The narrow age distribution in our study population (mean ± SD, 32 ± 9.7 years) might have reduced our ability to detect such an association. (In the German study, the mean age [±SD] was 40.0 ± 10.4 years[9]; in the Japanese study, it was 41.4 ± 11.2 years.[8])

In conclusion, the IGRA was a useful tool for baseline screening for LTBI in this population of HCWs with a high background of BCG vaccination. Hospital employees had a measurable extra risk of tuberculosis infection that was associated with certain places of work and with their country of origin but not with their profession.

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