

Surveillance of employees of Swiss Federal Asylum Centres for latent tuberculosis infection.

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Abstract

Background: Asylum seekers in Switzerland have to register in federal asylum centres (FACs) before formal permission to enter the country. Some of them may have active tuberculosis (TB), exposing fellow refugees and employees.

Objectives: To assess the risk of TB infection among employees of Swiss FACs.

Methods: between 2010 and 2018, a free Interferon-Gamma Release Assay (IGRA) was offered to all employees of eight FACs, at employment and at yearly intervals. We defined latent TB infection as IGRA conversion from negative to positive. IGRA-positive employees were referred to a medical centre for further clinical follow-up.

Results: 1427 tests were performed among 737 employees (54.6% male). 403 (55 %) persons were tested only once, 330 (44.5%) were tested several times, for four (0.5%) persons, the number of IGRA tests is unknown. Twenty employees (2.7%) had a positive IGRA at baseline, two (0.6%) converted from negative to positive during follow-up, resulting in an incidence of 22/10,000 person years. We observed no case of active TB among employees.

Conclusions: the prevalence of latent TB among employees to Swiss FACs and the risk of acquiring TB infection through work-related exposure are low. Yearly IGRA controls in the absence of documented TB exposure seem unnecessary.

Keywords: tuberculosis, health care workers, asylum centres, latent tuberculosis infection, LTBI

Tuberculosis (TB) patients with pulmonary involvement transmit the infection to bystanders through droplets spread into the air during coughing, sneezing, singing, or speaking. Health care workers may be exposed to patients with undetected or untreated pulmonary TB and are considered at increased risk of acquiring tuberculosis infection and, for some of them, progressing to active tuberculosis [1-3]. The risk of TB transmission is still high in countries with a high TB incidence, but in countries with low TB incidence, the infection risk is limited [4]. As all other European countries, Switzerland has a low TB incidence. Apart from health care workers and prison staff [5], workers in close professional contact with persons from high-incidence countries, defined arbitrarily as ≥ 100 per 100,000 population [6], may be exposed to tuberculosis.

Between 2010 and 2018, 15,000–39,000 migrants applied for asylum in Switzerland each year. The number of confirmed TB notifications to the Swiss Federal Office of Public Health in migrants diagnosed with active tuberculosis within 3 months after entry declined from more than 100 cases in the late 1990s to a mean of 42 cases per year between 2010 and 2018 (range: 21–66).

Swiss federal asylum centres (FACs) are thus considered institutions with potential TB risk. Swiss law requires employers to protect their employees [7, 8]. As all employees have close and frequent contact with the migrants, attention is given to the rapid detection of potentially transmissible diseases among the latter and to providing an adequate ventilation of the premises. Wearing of a face mask is not mandatory. A nursing staff is present on site and rapid access to medical assistance is provided. The screening procedure for the detection of active TB among asylum seekers changed over time. Between 1992 and 2005, all (non-pregnant) asylum seekers aged 15 or older were systematically screened with a chest X-ray. In 2006, this procedure was replaced with a 34-language online tool <http://www.tb-screen.ch/app/intro.php>, with questions covering tuberculosis symptoms, country of origin, and previous TB contacts, calculating a score to check if further clinical investigations were indicated. In 2018, the Swiss Epidemics Act was revised, rendering the online tool voluntary and providing basic education on TB symptoms and transmission as well as other relevant infectious diseases, in order to assure access to health care and vaccination. In 2000, the *Swiss Lung Association* and the *Swiss National Accident Insurance Fund (SUVA)* recommended that employees who may be exposed to TB are screened for latent TB infection with a

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Tuberculin skin test or an Interferon Gamma Release Assay (IGRA) at hiring, and that employees with a negative initial test working in a setting with elevated TB risk are re-tested at regular intervals [9].

In this article, we evaluate the risk of TB infection and the need for protective measures among men and women employed in Swiss federal asylum centres between 2010 and 2018.

Methods

Between January 2010 and December 2018, a blood test for the detection of latent TB infection (Interferon Gamma Release Assay = IGRA) was offered to employees of eight FACs: Basel, Boudry, Vallorbe, Chiasso, Altstätten, Kreuzlingen, Zürich and Zürich airport on a voluntary base. The test was repeated at yearly intervals in employees with a negative test result. Employees with a positive test result were referred to their family physician or to a pulmonary specialist for further medical follow-up. For logistical reasons, no tests were performed in 2016.

The participants gave a written consent for the registration of test results in an anonymous database aiming at the evaluation of the work-related risk of TB infection and improving protective measures if needed. Nationality, place of birth, place of prior employment or comorbidities of the employees were not recorded/documentated.

At the start of the observation period, all participating centres used T-SPOT.*TB* (Oxford Immunotec, Abingdon, UK). Blood samples were sent to the laboratory *Meditest* (later *Unilabs*) in Lausanne by express mail. Tests with a spot count of 0–4 were interpreted as negative, tests with a spot count of 5–7 were interpreted as borderline, and tests with a spot count of eight or more were interpreted as positive. Borderline and indeterminate tests were repeated whenever possible on another blood sample and only the second test result was recorded. In 2018, the FACs in Kreuzlingen, Altstätten, and Zürich changed the procedure and performed a QuantiFERON-Gold test (Qiagen, Hilden, Germany) instead of T-SPOT.*TB*. The sensitivity of both tests is between 80% and 90%, specificity is between 95% and 97% [9, 10].

The laboratories transmitted anonymised test results to the *Swiss Lung Association* and to the *State Secretariat for Migration SEM*.

Results

Over the eight active years of the study, 1,427 tests were performed among 737 employees (54.6% male). 403 (55%) persons were tested only once, 330 (44.5%) were tested several times, for four persons (0.5%) the number of IGRA tests was unknown. The number of tests and the test results (positive, negative and indeterminate) are reported in Table 1. Twenty employees (2.7%) had a positive IGRA at baseline (twelve of them were male). Two employees (0.6%) converted from negative to positive during follow-up, resulting in an

	2010	2011	2012	2013	2014	2015	2017	2018	Total
Baseline tests									
Positive	0	0	2	5	3	0	4	6	20 (2.4%)
Negative	22	23	156	235	116	22	139	113	826
Indeterminate	0	0	0	0	0	0	1	2	3 (0.3%)
Follow-up tests									
Stable Positive	NA	0	0	1	1	0	0	0	2 (3.4%)
Conversions	NA	0	0	1	0	0	0	1	2 (3.4%)
Negative	NA	15	39	39	208	88	119	61	569
Reversions	NA	0	0	0	2	0	0	0	2 (3.4%)
Indeterminate	NA	0	0	2		0	1	0	3 (3.8%)
Total	22	38	197	283	330	110	263	184	1,427

*No data was collected for 2016

Table 1: number of Interferon-Gamma Release Assays (IGRA) performed and test result in 737 employees across 8 federal asylum centres, 2010–2018*; NA: not applicable

incidence of 22.0 per 10,000 person years of follow-up (95% confidence interval: 5.5–87.9). One of these converters was a male, member of the administrative staff, who started working in the FAC in 1999, had a negative test result in 2012, 2013, 2014 and 2017 and turned positive in 2018 (QuantiFERON 0.64 IU/ml). The other converter was a female member of the security staff, who started working in 2009, had a negative test result in 2011 and 2012 and turned positive in 2013 (T-SPOT.TB 10 sfu). Two employees who had a positive test result at baseline (one in 2012, the other in 2013), had a negative test result at a control performed one year later (reversion).

All employees with a positive test result were referred to a physician for clinical examination and a chest-X-ray. None of them presented with symptoms or signs of active TB. The decision to offer a preventive treatment was left to the decision of the treating physician. Over the time of the study, no case of active TB among employees was observed.

Discussion

Screening for latent tuberculosis among employees of Swiss federal asylum centres between 2010 and 2018 showed that the risk of work-related TB infection is low. The baseline prevalence of 2.7% and the incidence of new infections during follow-up (22/100,000 person years of follow-up) were low, although all employees had close contacts with the asylum seekers in the FACs. These results are of the same order of magnitude as those reported for hospital employees in other low-TB-burden countries such as Canada [4] or the United States [11, 12], and much lower than the reports from high-TB-burden countries [13, 1-3]. Few studies have addressed the risk of work-related TB transmission outside hospitals: the risk of TB infection among prison inmates and staff is still considered substantial [5]. A study in Italy showed a prevalence of tuberculin skin test positivity of 9.9% among police officers dealing with migrants, with a progression by age from 1.6% in individuals aged 21 to 30 years to 14.1% in those aged over 50 years [14]. A hospital-based study in Germany also showed that the proportion of positive test results increased with age and duration of employment [15].

The risk of TB infection depends on the frequency of exposure to patients with untreated pulmonary TB, the duration of contact, and the concentration of infectious particles in the air. The latter mainly depends on the indoor environmental control. TB transmission is facilitated by overcrowding, poor ventilation and congregate settings [16]. During an observation period prior to this study, 4 conversions were observed among 71 employees of one Swiss FAC. The

facility had an inadequate ventilation system, with air flowing from the waiting-area at the entrance, where newly arrived migrants stayed until registration, to the staff room further inside the building. After correction of the airflow direction towards outside, no further infection was observed in this centre over the next 8 years. Another study demonstrated that the risk of infection was much higher among employees of an outpatient clinic where new migrants with health problems stayed in a closed waiting-room during long periods before being examined than in the local hospital where the patients with known TB were hospitalized and treated [17].

The prevalence of latent TB in employees of Swiss FACs was even lower than seen in other low-TB incidence countries with different immigration patterns (4.8% in the US and 8.7% in people without a history of TB exposure in the UK) [18, 19] and much lower than the estimated prevalence of latent TB infection worldwide [20]. The baseline prevalence in our study may not even reflect TB exposure in the FACs, as many employees originate from high-incidence countries – *e.g.* refugees hired as translators or assistance staff – and may have been infected abroad, in previous working places in Switzerland, or via non-professional social contacts, including family. Therefore, the two conversions observed during follow-up might better reflect the actual work-related risk.

The type of test we used for this study may influence the results. Since the introduction of IGRAs, these tests tend to replace the tuberculin skin test (TST) for surveillance purposes, at least in low-TB incidence countries and in populations with a large proportion of prior *Bacillus Calmette-Guérin* (BCG) vaccination. In a study of US health care workers with a very low proportion of prior BCG vaccination, the proportion of positive tests was similar (5.2% for TST, 4.9 for QFT and 6.0 for T-SPOT.TB). Contrastingly the rate of post-baseline conversion was higher for IGRA than for TST, however the majority of newly positive IGRAs having reverted to negative at the next yearly control [12]. Another study in the US confirmed the high rate (4.4%) of temporary conversions, 64.8% of them reverting to negative at control. The use of higher cut-offs for the definition of IGRA conversion yielded a conversion rate similar to historical conversion rates defined by TST increase in the same hospital settings [21, 11]. A more recent study among US hospital employees demonstrated that a very low proportion of them converted their TST over the observation period of 16 years (123/40,142), most of them without any documented exposure to TB and without confirmation by IGRA [22]. A German study resulted in similar low rates of conversion as defined by IGRA [23].

The question of the opportunity of systematic (for instance yearly) surveillance of exposed employees with a negative baseline test was much debated, mainly due to the observation of the high rate of temporary conversions and reversions and the seldom association with TB exposure [24]. In 2014, the Swiss recommendations for the surveillance of health care workers and employees in settings with an increased TB risk have changed [25]. Only one test at employment is recommended (allowing a detection of conversion in case of future exposure to TB). The forthcoming edition of the SUVA guidelines will do the same.

According to the CDC, positive IGRA results should be immediately confirmed by a repeated test, in order to minimise false positive results [26]. Recent data has demonstrated an association between the magnitude of the test result and the risk of future TB [27]. Therefore, the interpretation of the tests and the decision about the prescription of preventive treatment must take into account the individual risks (intensity of exposure, immune status, diabetes, current smoking and age) and the intensity of the test result [28, 29]. In our study, the test results in both employees who converted were close to the cut-off and may have represented temporary and not true conversions. The use of a higher cut-off, as proposed by some experts, may have changed our results [30].

This study has several limitations. First, as the tests were performed on a voluntary basis, we cannot exclude selection bias, but we do not believe that this bias is in any way related to the risk of TB infection. Second, we did not record the duration of employment prior to the first testing. Most of the first tests were performed in new employees, but some were already employed for several years, or may have been active in similar settings (hospitals, prisons, shelters) before. Some positive test results may thus reflect prior rather than current professional exposure. As the number of employees with a positive first test was low, we consider this a rare event. Similarly, because of overall small numbers, we did not study the correlation between age and IGRA positivity/conversion, however this has already been demonstrated by several other studies.

Conclusions

In conclusion, the surveillance of employees of Swiss FACs, where occasional cases of active TB have been detected among asylum seekers at entry, has demonstrated that the risk of TB infection for employees is very low. According to the recent Swiss and US recommendations, we conclude that a single IGRA test performed at employment is sufficient and that

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systematic surveillance is unnecessary, except in cases of documented exposure to a case of transmissible pulmonary TB.

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Statement of ethics: As the surveillance of the employees was performed in routine application of the federal regulations and according to the Guidelines of the SUVA, no ethical committee approval was requested.

Conflicts of interest: the authors have no conflict of interest to declare

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Authors contribution: JPZ, AZ and JME initiated the study, collected the results and drafted the ms, AZ supervised the performance of the laboratory analysis and collected the results, AKD supervised the organization in the FACs, AJS performed the statistical analysis and reviewed the ms. All authors reviewed the final version of the ms.

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