

## Tuberculosis in health care workers: a problem to be faced

### *Tuberculose em trabalhadores de serviços de saúde: um problema a ser enfrentado*

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**ABSTRACT:** Since the beginning of the seventies of the last century, several authors have pointed to tuberculosis as a health risk to health service workers. Studies show that these professionals are four times more likely to get sick from TB than the general population and that health professionals in hospitals have a positive tuberculin test rate of 63.1% and conversion to 8.7% (10.7% Per 1,000 people per month). The risk factors associated with conversion to the tuberculin test are: (1) nosocomial exposure to a patient with pulmonary TB; (2) professional category of nurse; and (3) absence of biosafety measures implemented at the hospital. Several authors point out: (1) a very high rate of infection among health professionals, which is an object of concern both for the health infection control team and for occupational safety professionals; (2) a positive tuberculin test rate of 26.7% in health professionals, with the majority of these workers having direct contact with patients with smear-positive tuberculosis; and (3) that professionals with less than four years of exposure to the bacillus had higher test positive rates. According to data of the Division of Tuberculosis (DVTBC) of the Center for Epidemiological Surveillance - SES / SP considering the years 2006 to 2016, an average of 210 new cases of the disease are reported in health care workers. Given this scenario and the urgency of implementing specific preventive actions for all workers potentially exposed to *Mycobacterium tuberculosis* (Bacillus of Koch or BK). In this sense, DVST and CVE of the State Department of Health of São Paulo formed a Working Group (WG) for the construction of a Protocol for the Prevention of Occupational Tuberculosis (PPTO). The objective of this article is to present a model, form and content of this instrument for the prevention of a serious occupational disease and for the health promotion of potentially exposed workers.

**Keywords:** Tuberculosis/prevention & control; Health personnel; Cross infection; Occupational risks.

**RESUMO:** Desde o início dos anos setenta do século passado vários autores apontam a tuberculose (TB) como risco à saúde dos trabalhadores de serviços de saúde. Estudos evidenciam que estes profissionais têm quatro vezes mais chance de adoecer por TB que a população em geral e que profissionais de saúde em atividade em hospitais têm taxa de teste tuberculínico positivo de 63,1% e conversão em 8,7% (10,7 por 1.000 pessoas/mês). São apontados como fatores de risco associados à conversão ao teste tuberculínico: (1) exposição nosocomial a paciente com TB pulmonar; (2) categoria profissional de enfermeiro; e (3) ausência de medidas de biossegurança implantadas no hospital. Vários autores apontam: (1) taxa de infecção muito elevada entre profissionais da saúde, o que se torna em objeto de preocupação tanto para a equipe de controle de infecção do ambiente de saúde quanto para os profissionais de segurança do trabalho; (2) uma taxa de positividade ao teste tuberculínico de 26,7% nos profissionais de saúde, tendo a maioria desses trabalhadores contato direto com paciente com tuberculose bacilífera; e (3) que os profissionais com menos de quatro anos de exposição ao bacilo apresentam taxas maiores de positividade ao teste. De acordo com os dados da Divisão de Tuberculose do Centro de Vigilância Epidemiológica da Secretaria da Saúde do estado de São Paulo, considerando os anos de 2006 a 2016, são notificados em média 210 casos novos da doença em trabalhadores de serviços de saúde. Diante deste cenário e da urgência de implantação de ações preventivas específicas para o conjunto dos trabalhadores potencialmente expostos ao *Mycobacterium tuberculosis* (Bacilo de Koch ou BK) constituiu-se um Grupo de Trabalho (GT) para construção de um Protocolo de Prevenção de Tuberculose Ocupacional (PPTO). O objetivo deste artigo é fundamentar a elaboração deste instrumento de prevenção de uma doença ocupacional grave e de promoção da saúde dos trabalhadores potencialmente expostos.

**Descritores:** Tuberculose/prevenção & controle; Pessoal da saúde; Infecção hospitalar; Riscos ocupacionais.

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## INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* (Mtb) that can affect any organ or system of the organism, preferably the lungs<sup>1</sup>. Respiratory transmission happens by inhalation of aerosols produced by coughing, speaking or sneezing from a patient with active pulmonary airway TB, either clinically pulmonary or laryngeal. These bacilli remain dispersed in the environment in aerosols for a period of time that depends on ventilation conditions and direct sunlight.

The risk of acquiring TB in the workplace is a concrete fact and concerns some professional categories, particularly and especially those that perform their work activities in health services<sup>2</sup>. We emphasize that, in this context, workers who care for people deprived of liberty and in social vulnerability should not be forgotten.

In these cases, the disease is considered as work-related or occupational (TBO)<sup>3,4</sup>. It is an occupational disease of compulsory notification in conjunction with the Notification Disease Information System (SINAN)<sup>5</sup>. In the case of workers with a link governed by the Consolidation of Labor Laws (CLT) to TBO, as it equates to occupational accident (AT), culminates with the issuance, by the employer, of the communication of the AT (CAT)<sup>6</sup>.

In recent years, the diagnosis of TB cases and its Multi-Drug Resistant (MDR-TB) and Extensively Resistant (XDR-TB) forms has shown deleterious consequences in health services where there is a high concentration of cases with isolation and protection measures way below the desired ones. Given this situation, one cannot but consider the importance of workers of these health services, especially the health care professional (PAS), as potential victims of these forms of TB.

According to the World Health Organization (WHO) in 2015, 480,000 people worldwide developed MDR tuberculosis and about 100,000 more people with rifampicin-resistant tuberculosis were also recently eligible for MDR-TB treatment. It is estimated that about 9.5% of these cases were XDR-TB<sup>7</sup>.

From the point of view of occupational disease prevention, the control of the transmission of different forms of intra-healthcare TB follows the general rule of epidemiology, starting with the assessment of the environment/job/work process to identify this risk agent, indicating, in the following, the short, medium and long term corrective measures provided for in the specific health and labor legislation, particularly the Environmental Risk Prevention Program (PPRA)<sup>8</sup>. From this information, a health promotion and disease prevention and health prevention program should be developed, also provided for in specific health and labor laws, particularly in

the Occupational Health Medical Control Program (PCMSO)<sup>9,10</sup>.

In this context, and due to the frequent complexity of health services, in the PCMSO should be considered all workers, regardless of employment, who, directly or indirectly, come into contact with confirmed or suspected cases of the disease, implementing actions of prevention of occupational tuberculosis (TBO).

## OBJECTIVES

1. Identify effective tools for confronting the transmission of TBO.
2. Point out disease prevention actions in health service workers.
3. Emphasize the importance of health promotion actions, in their broader context, in the control of TBO.
4. To support the elaboration and implementation of an instrument to promote and preserve the health of all workers potentially exposed to Mtb.

## METHOD

An alternative bibliographic research<sup>11</sup> was adopted that allowed participation, debate and reflection in the construction of learning, based on the analysis of the dominant theories and practices recommended by the specialized literature and current legislation. Based on this, a working group (GT) was constituted that represented all the actors involved in the process, in a tripartite model. This GT consisted of representatives:

1. From the São Paulo State Secretariat of Health (SES/SP): from the Technical Division of Sanitary Surveillance at Work (CCD/CVS/DVST/CEREST Estadual); the Tuberculosis Division (DVTBC) of the Epidemiological Surveillance Center (CCD/CVE); Health Service (CCD/CVS/SERSA); the Environmental Action Service (CCD/CVS/SAMA); the Quality of Life and Professional Environment Improvement Center (CRH); the Health Services Coordination (CSS);

2. Of the class councils: Regional Council of Medicine of the State of São Paulo (CREMESP) and Regional Council of Nursing of the State of São Paulo (COREN-SP);

3. From the employee unions: Union of Nursing Assistants and Technicians and Employees in Health Care Facilities (SinSaudeSP); São Paulo State Public Health Workers Union (SINSAUDE);

4. From the employers' unions: Santos Casas Union and São Paulo Philanthropic Hospitals (SINDHOSFIL); Union of Hospitals, Clinics and Laboratories of the State

of São Paulo (SINDHOSP); and

5. Paulista Association of Occupational Medicine (APMT).

Through systematic meetings, the work was developed for 18 months in six moments, namely:

1. Definition of work process;
2. Study of selected articles for evaluation and debate;
3. Study of legislation on the subject.
4. Broad discussion;
5. Conducting the lecture in a specialized event.
6. Study completion and preparation of this article.

Regarding the study of the selected articles, a narrative bibliographic review was performed considering the national and international literature determining the current knowledge on the studied subject in order to enable the identification, critical analysis and synthesis of the verified results, pointing out any gaps and existing theoretical barriers. The theoretical framework was built through the contextualization of all relevant information and studies in order to qualify the discussion of results and consistently answer the problem under study<sup>12</sup>. This review was conducted by researching scientific articles related to the theme, in particular PubMed/Medline, Embase, Scopus, SciELO and other databases, as well as books, historical records, theses, dissertations, and government legislation, documents and standards, among others. The following descriptors were used: Tuberculosis; Health workers; Hospital Infection and its English correspondents, according to DeCS (Health Sciences Descriptors).

## RESULTS AND DISCUSSION

### Tuberculosis in health services

The magnitude of the risk of TB transmission differs from one institution to another and within the same institution from one environment to another. Since the early seventies of the last century, several authors have pointed TB as a health risk for healthcare workers. Craven et al.<sup>13</sup> report an annual tuberculin conversion rate of 2.2% and 5.6%, respectively, in groups of health professionals under 50 years of age (considered high when compared to the general population). Morrone et al.<sup>14</sup> observed that health professionals from the State Server's Institute of Medical Assistance-SP were four times more likely to become ill (due to TB) than the general population.

Barrett-Connor<sup>15</sup> found a higher tuberculin conversion rate in pulmonology residents than in infectious and parasitic disease (5.65% and 1.19%, respectively).

Bass et al.<sup>16</sup> observed high rates of tuberculin conversion in medical clinic, pediatrics and surgery; intermediate rates in the gynecology and obstetrics sectors; and low conversion rates among professionals working in radiology and psychiatry.

Souza et al.<sup>17</sup> studying health professionals from the Clementino Fraga Filho University Hospital of the Federal University of Rio de Janeiro found a tuberculin conversion rate of 9.2%, which is higher when compared to those found in a Rio de Janeiro favela (4%) Muzzy et al.<sup>18</sup>, Kritski et al.<sup>19</sup> and Roth et al.<sup>20</sup> report a high rate of TB transmission in medical schools, university hospitals, prisons and psychiatric nursing homes. Roth et al.<sup>20</sup> studying 4,419 active health professionals in four hospitals found that the positive tuberculin test rate was 63.1%, and the conversion rate was 8.7% (10.7 per 1,000 people/month).

Risk factors associated with conversion to tuberculin skin test were nosocomial exposure to a patient with pulmonary TB, a professional nurse category, and the absence of biosafety measures implemented in the hospital<sup>20</sup>. Teixeira and Oliveira<sup>21</sup> point out (1) a very high infection rate among health professionals, which becomes a concern for both the health environment infection control team and occupational safety professionals; (2) tuberculin test positivity rate of 26.7% in health professionals, with most of these workers having direct contact with a patient with bacilliferous TB; and (3) that professionals with less than four years of exposure to bacillus had higher rates of test positivity.

According to the Brazilian Ministry of Health<sup>22</sup>, the risk of acquiring TB in the general population is 3 to 20 times higher among nursing professionals, 6 to 11 times higher among clinical pathologists, 2 to 9 times higher among bacteriology laboratory technicians and 6 times higher among pulmonologists. According to the DVTBC data from CCD/CVE - SES/SP, considering the years 2006 to 2016, an average of 210 new TB cases were reported in health service workers.

### Disease prevention actions in potentially exposed workers

The tools referred to in the literature as effective for coping with in-hospital TB transmission or objectively, for the control and prevention of occupational tuberculosis (CPTO) addressed here relate specifically to the clinical and epidemiological management of suspected and confirmed TB patients with focus on promoting and conserving the health of workers potentially exposed to Mtb.

Preventive actions at work have their basis in the *analysis of the risk* of acquiring disease or health damage resulting from work activity, in the case of TB in health

services. They have their beginning in identifying the risk, characterized by anticipation and recognition (or suspicion) of the presence of the source (bacilliferous patient) and/or the necessary risk agent (Mtb) to acquire TB in the process/work environment, also considering the bacilliferous patient's journey and time spent in different locations of the unit. The next step is **risk assessment**. Although, from the occupational legal point of view, activities involving biological agents have the unhealthiness characterized by the qualitative assessment (Annex XIV of NR15)<sup>23</sup>, the potentiality of the risk should be assessed considering, in the studied institution, especially: (1) incidence of TB disease and the prevalence and incidence of latent tuberculosis infection (ILTB) in the health service; (2) the existence or otherwise of adequately protected procedure and isolation rooms for TB; (3) the availability and quality of TB personal protective equipment (EPI) offered to healthcare professionals; and (4) the sensitivity profile of the drugs used in TB treatment in the institution.

In addition, it is recommended that **risk enhancers** be identified, ie conditions related to the work process/environment and individualities capable of increasing the risk of acquiring TB at work. Regarding the **work process/environment** it is recommended to consider as a risk situation of occupational acquisition of TB work or operations that expose the worker to continuous and permanent contact, not eventual and not intermittent, with the risk agent (Mtb), namely : (1) contact with patients diagnosed with bacilliferous TB; (2) working in hospitals, emergency services (screening and adult waiting room), medical wards and outpatient clinics, infectious diseases, pneumology, HIV/AIDS, dental services (applies especially to those for patients with infectious diseases), bronchoscopy rooms, X-ray rooms, vaccination posts and other services for human health care (applies only to personnel in contact with patients); (3) mycobacteriology laboratories (applies only to technical personnel); and (4) necropsy, anatomy and histoanatomopathology rooms (applies to technical personnel only).

Specifically in relation to **exposure to the risk agent** (Mtb) it should be considered that continuous and permanent exposure must be proven by means of the Technical Report of the Environmental Working Conditions (LTCAT), PPRA and Social Security Profile (PPP), or program. equivalent in health services whose employment relationship is not governed by the Consolidation of Labor Laws (CLT). These analytical tools will indicate the application of a specific TBO control program to that worker or group of workers, bearing in mind that the regularity and permanence of working time under special conditions detrimental to health or physical integrity referred to in Article 57, § 3º, of Law 8.213 / 91 do not presuppose continuous exposure

to the harmful agent throughout the workday, and should be interpreted as meaning that such exposure should be inscribed to the development of the activities committed to the worker, integrated to his work routine, and not occasional, eventual occurrence<sup>24</sup>.

Regarding the **worker's clinical and general health status** - "individual risk", the following should be considered: (1) **high risk**: when the worker (1.1) has HIV; (1.2) is transplanted; (1.3) is using anti-TNF; (1.4) has kidney failure on dialysis; (1.5) has an X-ray with a picture suggestive of previously untreated TB sequelae; (1.6) has a head and neck cancer; (2) **moderate risk**: when the worker uses corticosteroids (prednisone dose > 15mg for more than 1 month); and (3) **low risk**: when the worker is not included in the above items.

### Importance of health promotion actions

Health promotion is closely related to the so-called "primary and secondary actions", ie **identification and control of the risk agent** and **case tracking**. For workers potentially exposed to Mtb, such as those caring for sick people, persons deprived of liberty and people in social exclusion, these actions should be based on the following steps<sup>8</sup>:

1. **Anticipation and recognition of the risk agent**: considering here the presence of the bacilliferous patient;

2. **Mtb identification**: refers to the characteristics of the agent in a specific environment, including its resistance to drugs indicated for treatment;

3. **Safety signs**: provided after the identification and location of hazardous environments and possible generating sources;

4. **Risk expansion assessment**: identifying possible paths and means of propagation of Mtb in the workplace;

5. **The qualification of the problem**: by characterizing the functions, activities and type of exposure (eg, whether direct or indirect; whether deliberate or unintentional) and also on the potentializing determinants;

6. **Quantifying the problem**: identify the number of workers exposed;

7. **Analysis and follow-up**: (1) obtain existing data in the institution indicative of possible health compromises due to work (indicators of absenteeism, morbidity and accidents profile); (2) compare these data with those available in the technical literature; (3) describe existing control measures; and (4) monitor the results obtained.

Thus, based on the collected data, an integrative medical control program should be developed for this specific group of workers to be applied in the medical

examinations (EM) that compose the PCMSO, namely: (1) Admissional EM; (2) Periodic EM; (3) Return to Work EM; (4) Change of Function EM; and (5) Demissional EM<sup>9</sup>.

### **Health promotion and conservation instrument for all workers potentially exposed to Mtb**

Given the above, it is necessary to elaborate and implement a health promotion and conservation instrument for all workers potentially exposed to Mtb, that is, an Occupational Tuberculosis Prevention Protocol (PPTO), which, based on the researched literature, we substantiate below.

In the elaboration of the PPTO, it is obligatory to: (1) *“consider the incidents concerning the individual and the collective of workers, privileging the clinical-epidemiological instrument in the approach of the relation between their health and work”*; (2) ensure *“prevention, screening and early diagnosis of work-related health problems, including subclinical ones, in addition to finding cases of occupational diseases or irreversible damage to workers’ health”*; and (3) *“be planned and implemented based on workers’ health risks”* (in this case, especially regarding the risk of acquiring TB)<sup>9</sup>.

It is desirable that the PPTO also support occupational safety control measures through the implementation of care flow that ensures early diagnosis of suspected cases of TBO, treatment and return to work. To this end, it must have a multidisciplinary character, which should include at least: (1) specialists from the Specialized Services in Safety Engineering and Occupational Medicine (SESMT)<sup>25</sup>, and (2) infectious disease specialist and/or member of the Control Committee. Hospital Infection (CCIH)<sup>10</sup>. Workers should also be involved and supported by the Internal Accident Prevention Commission (CIPA)<sup>26</sup> or the Occupational Health Commission (COMSAT)<sup>27</sup>.

It is recommended that in the structuring, implementation and development of PPTO from the contextualization and implementation of **risk identification and risk assessment** steps as described above, **control measures** should be implemented.

**About the implementation of control measures:** based on the anticipation and recognition of the risk, the PPTO should be structured, developed and implemented to prevent the acquisition of TB due to occupational exposure. These measures fall into three categories: (1) managerial or administrative; (2) engineering or environmental control; and (3) individual protection.

**On managerial or administrative measures;** It is generally agreed that these measures alone are the most effective and least costly in preventing TB transmission. Analyzing, for example, the path of the bacilliferous patient

and his time spent in different locations of the unit, changes should be proposed in the organization of the service, training of professionals and restructuring of care. The following must be included in these measures:

1. The development and implementation of written policies and protocols (Standard Operating Procedures - POP) that standardize related work processes: (1.1) active search in “Respiratory Symptomatic” (SR), ie people who have coughed for three weeks or more; (1.2) the transport of bacilliferous patients; (1.3) care and performance of procedures in a suspect or bacilliferous patient; and (1.4) the management of suspected or confirmed TB cases (ensuring rapid identification, respiratory isolation, diagnosis, treatment of TB patients, and clinical and laboratory criteria for adopting and suspending biosecurity measures)..

2. Ensuring the implementation and development of permanent training and education programs based on POP, for health care workers, according to exposure risk levels, to reduce occupational exposure; and

3. The structuring and implementation of surveillance protocol to recognize suspected cases of occupational TB acquisition, expedite the diagnosis of pulmonary TB, promote appropriate treatment and ensure the humanized return of workers when they are no longer bacilliferous.

### **About engineering or environmental control measures**

These measures include, for example, fitting furniture and service spaces, with particular attention to ventilation aspects, and, at selected locations, negative pressure to create Mtb-free working environments. These measures should consider that the higher the ventilation, daylighting and sunlight in a health facility, the lower the risk of TB transmission. These measures include:

1. Choose the environment of permanence of possible respiratory symptomatic as ventilated as possible (if conditions exist, outside areas should be designated for consultation);

2. Places of care for patients with suspected/confirmed TB should be air refreshed at least six to ten times per hour and preferably have negative pressure relative to adjacent areas;

3. Exhausted air shall be directed outside the unit where there is no movement of persons and air intake systems; For this purpose, if necessary, the hood can be connected to a duct, so that the air discharge can be made at least seven meters from such places. If this is not possible, high-efficiency particulate air filters (Hepa - *High Efficiency Particulate Air*) should be used, which eliminate airborne bacilli, allowing air to be discharged into environments where people circulate;

4. Designate a suitable sputum collection site, preferably outdoors and never inside the unit, unless the facility has a properly prepared collection environment, such as a negative pressure room, ensuring sufficient patient privacy. (never use closed rooms, such as bathrooms). When available, identify appropriate environment for collection of induced sputum examination;

5. In hospital and emergency services, the definition of sufficient respiratory isolation sites and adequate conditions to meet unit demand is considered a high priority, according to Collegiate Board of Directors Meeting (RDC) 50 of 2002<sup>28</sup>.

### About individual protection measures

These measures are necessary but not singly sufficient to ensure the safety and health of the healthcare worker in the management of suspected or TB patients. In this sense:

1. Should be clearly standardized when and where the respirator (type PFF2, Brazilian and European Union standard, or N95, United States - US standard) is to be used for healthcare professionals when entering areas at high risk of transmission (respiratory isolation rooms, referral outpatient clinic for SR, bacillifers and TB patients with suspected or confirmed resistance to drugs used to treat TB);

2. The use of surgical masks is recommended for patients with pulmonary TB or SR at potential risk of transmission, eg lack of adequate ventilation structure in waiting rooms and emergencies while awaiting case definition (care, test results, hospitalization in isolation) or relocation of patients from isolation for examinations or procedures (in this case, the patient should be prioritized in the other sector);

3. The doors of the rooms in which patients suspected or confirmed of TB disease are admitted shall be kept completely closed throughout the isolation period and duly marked with the symbolism of the risk and precautionary measures in order to identify from where individual protection measures are mandatory;

4. Healthcare professionals who wear masks should be trained and supervised regarding their proper use and storage. They should also be advised not to remove masks from health services at the end of the work period to avoid forgetting to bring them when they return. The health service should, in its different workplaces, provide adequate places for masking so that they will not be damaged;

5. EPI shall be made available on an ongoing and uninterrupted basis to all exposed professionals, whether outsourced or not, including casual workers, eg. professionals on duty. In the case of outsourced services, it must be specified in the service contract who must provide EPI to the worker, contractor or contractor;

6. Conditions should be given for standard precautionary, contact, droplet and aerosol precautionary measures.

### On the medical control of potentially exposed workers

Regarding the control of potentially exposed workers and considering the previously defined criteria, the following protocol is recommended.

1. In the **Admission Medical Examination**: the candidate must attend for clinical and occupational evaluation with recent chest X-ray (maximum 15 days) and must be submitted to the basic protocol contained in Chart 1.

2. In the **Periodic Medical Examination**: the worker must attend for clinical and occupational evaluation with recent chest X-ray (maximum 15 days) and must be submitted to the basic protocol contained in Chart 2.

3. At the **Return to Work Medical Examination** (after removal for TB treatment): the worker must: (3.1) Submit a medical report and negative bacilloscopies results; (3.2) Be hosted in a clinical and psychosocial support group to monitor, facilitate and ensure adherence to Directly Observed Treatment (TDO); and (3.3) Receive an Occupational Health Certificate (ASO) issued by the Occupational Physician.

4. In the **Job Change Medical Examination**: the focus should be on the new activities the worker will perform and or the new work environment; Once the risk of TB is confirmed, the protocol to follow is the same as the Medical Examination.

5. The **Dismissal Medical Examination** has the specific objective of evaluating if the worker is being dismissed with illness or injury that incapacitates him/her for work. Thus, in the case of workers who, due to their work activities, were exposed to Mtb, it is up to the Occupational Physician to assess their occupational medical history and, when appropriate, to request specific exams or specialist evaluation before issuing the ASO as fit. If the disease is found, the dismissal process should be suspended to be resumed only at discharge.

**Chart 1** - Admission Medical Examination candidate for work in a risk area for TB

Exam moment	Before the worker takes over his activities.
<b>Composition</b>	<p><b>Occupational anamnesis</b> with emphasis on previous exposure to bacilliferous patients (degree of risk and/or prolonged exposure)</p> <p><b>Clinical anamnesis</b> with emphasis on investigation <b>(1)</b> of history of TB (is or has been treated for TB?); <b>(2)</b> active TB - disease - (basic questions <b>(*)</b> have you coughed for more than 3 weeks? <b>(*)</b> Have had fever? Weakness? Weight loss? Night sweats? <b>(3)</b> the candidate's clinical <i>status</i> (inquire about neoplasms), decompensated diabetes and other diseases, especially immunodepressants, organ transplantation and use of immunosuppressive drugs (anti-TNF<math>\alpha</math>).</p> <p><b>Chest X-ray</b> taken at most 15 days ago.</p> <p><b>Other examinations</b> counseling on offering HIV and other controls appointed in the PCMSO.</p>
<b>ILTB Research</b>  <b>[Request Tuberculin Test (PPD) read by reference reader]</b> <b>[or, in the absence of PPD, Interferon-Gamma Detection Tests (IGRAs)]</b>	<p><b>(*) PPD <math>\geq</math> 10 mm or positive IGRA:</b> inform that the test does not mean active TB but infection; You should never repeat the PPD again.</p> <p><b>(*)</b> In case of immunocompromised, refer to the Health Unit reference for TB for decision on treatment with isoniazid (see website <a href="http://www.cve.saude.sp.gov.br/tuberculose">www.cve.saude.sp.gov.br/tuberculose</a>).</p> <p><b>(*) PPD &lt;10 mm or negative IGRA:</b> inform that the test does not mean active TB but infection; register in the occupational health record; repeat the test after 1 to 3 weeks (if the result &lt;10mm persists repeat the test annually); If you come to work in an area of risk for TB, indicate annual monitoring to be done at your workplace's SESMT or at the referral Health Unit.</p>
<b>Conduct</b>	
<b>Clinical</b>	<p><b>(*)</b> In case of any affirmative answer above <b>(1)</b> request sputum bacilloscopy, culture, identification and susceptibility testing and, if possible, Rapid Molecular Test (TRM); active TB confirmed <b>(1)</b> treat or <b>(2)</b> refer for treatment at TB referral facility with test results or clinical summary.</p> <p><b>(*)</b> Candidate reporting being immunosuppressed or using immunosuppressant should be referred to a Health Unit for possible treatment of latent infection (ILTB).</p> <p><b>(*)</b> Register clinical and subsidiary examination results and conduct in the occupational health medical record.</p>
<b>Occupational</b>	<p><b>(*)</b> Any applicant <b>suspected</b> of having active TB should be considered <b>temporarily unfit</b> for any work activity in health services until this possibility is proven to be ruled out.</p> <p><b>(*)</b> Any candidate <b>confirmed</b> to have active TB should be considered <b>unfit</b> until they cease to be contagious (in the case of bacillus until, after 15 days of treatment, they have three negative bacilloscopies within 24 hours).</p> <p><b>(*)</b> Because they have the highest known risk of becoming ill from tuberculosis, the following should be considered <b>unfit</b> to work with suspected or ill patients: <b>(1)</b> any immunosuppressed candidate; and <b>(2)</b> people living with HIV/AIDS (PVHA).</p>

**SOURCES:** (1) São Paulo. CVE/ CVS-SES-SP. Bombarda, S. Galesi, V.M.S.; Pustiglione, M.; Santos, L.A.R. Protocolo de controle médico de tuberculose ocupacional, 2015<sup>29</sup>; (2) São Paulo. Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo. 3<sup>a</sup> ed. 2009<sup>30</sup>; (3) Nota Informativa nº 08 de 2014 – CGPNCT/DEVEP/SVS/MS<sup>31</sup>.

**Chart 2** - Periodic Medical Examination for PAS working in the area at risk for TB

<b>Frequency</b>	<p><b>Half-yearly</b> - for PAS who work in the direct care of suspected or TB patients and potentially exposed health care workers (TSS) such as those who work in cleaning and sanitation and in the pantry if they serve meals.</p> <p><b>Annual</b> - for TSS administrative areas when no risk can be guaranteed.</p>
<b>Composition</b>	<p><b>Occupational anamnesis</b> with emphasis on exposure to bacilliferous patients (degree of risk and/or prolonged exposure)</p> <p><b>Clinical anamnesis</b> with emphasis on investigation <b>(1)</b> of active TB (basic questions <b>(*)</b> have you coughed for more than 3 weeks? <b>(*)</b> Have presented fever? Weakness? Weight loss? Night sweats?) <b>(3)</b> worker clinical status (inquire about neoplasms, decompensated diabetes and other diseases, especially immunodepressants, organ transplantation and use of immunosuppressive drugs (anti-TNF<math>\alpha</math>).</p> <p><b>Chest X-ray</b> taken at most 15 days ago.</p> <p><b>Other exams</b> HIV counseling and other PCMSO controls.</p>
<b>ILTB investigation</b>	Applied and read by reference reader for PAS that has a previous result of PPD<10mm or negative IGRA.
<b>Conduct</b>	
<b>Clinical</b>	<p><b>(*)</b> In the case of any affirmative response in the active TB investigation request sputum bacilloscopy microscopy, culture, identification and susceptibility testing and, if possible, TRM; active TB confirmed <b>(1)</b> treat or <b>(2)</b> refer for treatment at TB referral facility with test results or clinical summary.</p> <p><b>(*)</b> PAS reporting being immunosuppressed or using immunosuppressant should be referred to a Health Unit for possible treatment of latent infection (ILTB).</p> <p><b>(*)</b> Register clinical and subsidiary examination results and conduct in the occupational health medical record.</p>
<b>Occupational</b>	<p><b>(*)</b> Any PAS <b>suspected</b> of having active TB should be considered <b>temporarily unfit</b> for any work activity in health services until this possibility is proven to be ruled out and <b>(1)</b> treated or <b>(2)</b> referred to the TB referral facility.</p> <p><b>(*)</b> If this time of absence exceeds that established by current legislation, the PAS should be referred to a medical expert in order to acquire the right to receive social security benefit (Species 31) which, if the disease is confirmed, should be transformed into sickness accident insurance (Species 91), because, according to Ordinance No. 1339, november 18, 1999<sup>3</sup> TB is part of the "List of Work-Related Diseases".</p> <p><b>(*)</b> <b>Immunosuppressed</b> PAS or <b>using immunosuppressive</b> drugs without suspected active TB should be removed from the hazardous area by an ethical document (ASO, eg) indicating the need for a change in area and/or activity while the patient's immune deficiency condition continues.</p> <p><b>(*)</b> Any PAS <b>confirmed</b> as having active TB should be considered <b>unfit</b> until it is no longer a risk of contagion (in the case of bacillus until, after 15 days of treatment, it has 3 negative bacilloscopies within 24 hours).</p> <p><b>(*)</b> As a result, the aforementioned PAS must be removed from work and sent to a medical expert to acquire the right to receive sickness benefit due to an occupational accident (Species 91); To this end, the Health Service should, in the case of workers with employment relationship governed by CLT, provide CAT on the date of diagnosis of the disease.</p> <p><b>(*)</b> In the case of a statutory or permanent civil servant of the São Paulo State Secretariat of Health, the Occupational Accident Notification or Information (NAT-IAT)<sup>32</sup> should be provided.</p> <p><b>(*)</b> All confirmed TB cases, regardless of the type of employment, must also be reported to the São Paulo State Information System - TB Web integrated with SINAN.</p>
<b>Based on individual risk</b>	Discarding active TB, classify the PAS according to item 11.3.2 and adopt one of the following conducts <b>(1) High Individual Risk</b> : the worker should not be housed in an area of probable presence of bacilliferous patients; should perform PPD or IGRA and be referred to a referral health facility to assess possible treatment for latent TB; <b>(2) Moderate Individual Risk</b> : The worker should perform the PPD or IGRA and be referred to a referral health facility to assess possible treatment for latent TB; or <b>(3) Low Individual Risk</b> : The worker should participate in tuberculin monitoring if working in a hazardous area, provided they have a PPD<10 mm or negative IGRA.

**SOURCES:** (1) São Paulo. CVE/CVS-SES-SP. Bombarda, S. Galesi, V.M.S.; Pustiglione, M.; Santos, L.A.R. Protocolo de controle médico de tuberculose ocupacional, 2015<sup>29</sup>; (2) São Paulo. Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo. 3a ed. 2009<sup>30</sup>; (3) Nota Informativa nº 08 de 2014 – CGPNCT/DEVEP/SVS/MS<sup>31</sup>.

## CONCLUSIONS

The PPTO should be a proactive, preventive and multidisciplinary plan focused on the risk of acquiring TBO in which at least SESMT and CCIH specialists should participate and be actively represented by CIPA or COMSAT.

The PPTO shall ensure occupational safety control measures by implementing identification flow and prompt handling of suspected cases for early diagnosis of TBO, treatment and prompt and safe return to work.

In this process it is essential (1) the development and implementation of written policies and updated protocols; (2) the effective and adequate training of workers potentially exposed to Mtb; (3) the provision of safe environments (isolated and ventilated); (4) the indication and guarantee of uninterrupted availability of EPI for all exposed professionals; and (5) the installation of physical barriers and risk identification plates and precautionary measures.

These occupational safety actions should be spelled out in POP that standardize procedures and indicate levels of responsibility.

The construction of responsibility must have a shared character involving the employer (specific managers and SESMT) and workers (CIPA or COMSAT).

The implementation and development of programs and actions for training and permanent education of potentially exposed workers should count, whenever necessary and possible, with the support and co-responsibility of the union and category representations.

Cases of TBO must be registered in an occupational medical record and its notification is compulsory in the São Paulo State Information System - TB Web, integrated with SINAN<sup>5</sup>.

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In addition: (1) in the case of CLT-regulated Health Care workers, CAT should be provided; and (2) in the case of a statutory or permanent civil servant of SES-SP, NAT-IAT shall be provided.

To assess the results of the implementation of control measures, monitoring and results indicators should be defined and established from “zero time”, particularly those related to compliance with the recommendations established and follow-up by SESMT of potentially exposed workers.

Workers included in high and moderate risks should not be considered fit to perform activities that expose them to contact with Mtb and this condition must be included in the ASO.

As for work disability or work due to TB, it should be understood, according to the definition given by the National Institute of Social Security (INSS), namely: “*the impossibility of performing the specific functions of an activity (or occupation), as a result of morphopsychophysiological alterations caused by illness or accident.*”<sup>33</sup>. It is also understood as incapacity for work “*the risk to oneself or others, or the aggravation of the pathology under analysis, that the permanence in activity may entail*”<sup>33</sup>. Thus: (1) there will be labor disability every time and whenever the worker has or suspects bacilliferous TB during the entire transmission period, (2) this assessment must be part of the occupational exams defined in the PPTO; and (3) the temporary unfit condition must be explicit in the ASO. When returning to work, after specialized evaluation or effective treatment, being excluded the condition of “bacilliferous”, should proceed as recommended in the item regarding the Return to Work EM.

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