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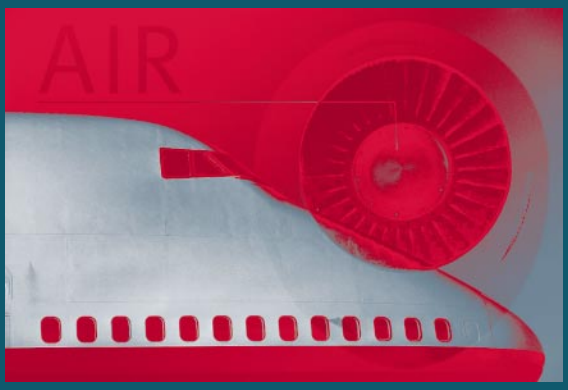
TUBERCULOSIS *and* AIR TRAVEL:



GUIDELINES FOR PREVENTION AND CONTROL

WORLD HEALTH ORGANIZATION

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TUBERCULOSIS AND AIR TRAVEL: GUIDELINES FOR PREVENTION AND CONTROL

Communicable Diseases Cluster

TUBERCULOSIS AND AIR TRAVEL:

GUIDELINES

FOR PREVENTION AND CONTROL

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CONTENTS

Approximately one third of the world's population is infected with *Mycobacterium tuberculosis*, and tuberculosis (TB) is the leading cause of death from a single infectious agent in adults worldwide. In 1996, 3.8 million new cases of TB were reported to the World Health Organization (WHO), but it is estimated that nearly eight million cases might have occurred worldwide.

Effective TB control is based on proper detection of cases and appropriate treatment until cure. The WHO strategy for TB control, Directly Observed Treatment, Short-course (DOTS), ensures that cases are detected and treated with proper regimens. DOTS remains the highest priority in order to achieve TB control throughout the world.

Over the past few years, technology has made travelling easy and readily available. Increasingly larger numbers of people are using international air travel for business, tourism, and other reasons such as immigration or asylum seeking. Several outbreaks of communicable diseases, such as staphylococcal food poisoning, measles, influenza, and others, following exposure within a commercial aircraft, have been documented. Likewise, exposure to infectious TB on commercial aircraft is a real concern for both passengers and crew.

To date, no case of active TB has been identified as a result of exposure while on a commercial aircraft. However, there is some evidence that transmission of *M. tuberculosis* may occur during long (i.e. more than eight hours) flights, from an infectious source (a passenger or crew member) to other passengers or crew members.

TB infection is acquired through inhalation of *M. tuberculosis* in aerosolized respiratory secretions from an infectious person coughing, talking or sneezing. The risk of infection is related to the proximity and the duration of exposure to the source patient. Decreased ventilation in crowded and confined environments is often a contributing risk factor. Although a single flight carries the risk of a relatively limited exposure, prolonged sojourn in a confined aircraft cabin may increase the risk of transmission of *M. tuberculosis*.

In the past few years, several episodes of potential transmission of TB infection during air travel have been reported, some of which raised great anxiety among the general population, health authorities, mass media and airline companies. On these occasions, health and airline representatives have sought guidance from WHO and other national agencies.

This report addresses the growing concern about TB transmission during air travel (including its prevention, management of infectious passengers, contact tracing, and passenger information procedures) within the broader context of TB control efforts.

WHO, in collaboration with international TB experts, civil aviation authorities, and representatives of airline companies, has produced guidelines to provide airline companies, health authorities, physicians and air passengers with: 1) the available scientific background on the issue of TB transmission on aircraft; 2) a review of the past practices adopted for the management of patients with infectious TB and history of air travel, and of the most commonly encountered difficulties; 3) suggestions on practical ways to reduce the risk of exposure to *M. tuberculosis* on board; and 4) guidance on procedures to follow when a case of infectious TB is diagnosed with a history of air travel, including tracing and screening of contacts for possible interventions.

These guidelines will apply to all domestic and international airline carriers throughout the world.

Acid-fast bacilli (AFB)
Rod-shaped bacteria that do not lose their stain when exposed to acid-alcohol mixture after the staining process, i.e. *Mycobacterium tuberculosis* and all mycobacteria.

Bacille Calmette-Guérin (BCG)
A live vaccine against TB derived from an attenuated strain of *Mycobacterium bovis*. Efficacious to prevent disseminated forms of TB in children; of debatable efficacy against adult forms of TB.

CDC
Centers for Disease Control and Prevention, Atlanta, GA, USA.

CDS
Communicable Diseases Cluster of the World Health Organization.

Contact
A person considered by the health authorities as having been in contact with an infectious person, indicating the possibility of having been infected.

Contact tracing
The process of identifying contacts of index cases, for whom public health measures may be required.

Crew
Personnel of an airline who are employed for duties on board the aircraft (flight attendants and pilots).

Epidemic
The occurrence in a community of a number of cases of an illness, which is clearly in excess of normal expectancy.

Extra-pulmonary TB
TB of organs other than the lungs. This includes TB of the pleura, lymph nodes, gastro-intestinal tract, spleen, genito-urinary tract, skin, joints and bones, and meninges.

Haemoptysis
Coughing blood or blood-containing sputum.

HIV
Human Immunodeficiency Virus, the agent of the Acquired Immunodeficiency Syndrome (AIDS).

ICAO
International Civil Aviation Organization.

Immigrant
A foreigner legally admitted and expected to settle in a host country.

Incidence
The number of persons in a defined population who fall ill with a certain disease during a defined time period.

Infection with *M. tuberculosis*
The subclinical, latent infection with tubercle bacilli, manifested by a positive tuberculin skin test, without clinical evidence of disease.

In-flight or Flight time
The time elapsing between the closing of the doors of an aircraft before takeoff and their opening at the gate on arrival. This would include delays on the ground after the aircraft doors are closed, actual time in the air and delays on the ground after landing.

Laryngeal TB
TB affecting the larynx (voice box).

Multi-drug resistant tuberculosis (MDR-TB)
TB caused by strains of *Mycobacterium tuberculosis* which are resistant to, at least, isoniazid and rifampicin.

Mycobacterium tuberculosis
The bacterium that causes TB.

NGO
Non-Governmental Organization.

NTP
National Tuberculosis Programme.

Outbreak
The occurrence of two or more linked cases of a communicable disease.

Preventive therapy (for persons infected with *M. tuberculosis*)
The treatment of subclinical, latent infection with *M. tuberculosis* to prevent progression to active TB, usually based on 6-12 months of isoniazid orally.

Pulmonary TB
Tuberculosis affecting the lungs.

Refugee
A person who meets the refugee definition of the 1951 Convention related to the Status of Refugees and its 1967 Protocol, or of other relevant regional instruments.

Short Course Chemotherapy (SCC)
Treatment with the combination of at least four major TB drugs, i.e. isoniazid, rifampicin, pyrazinamide and ethambutol (or streptomycin), for a six or eight months' duration.

Smear conversion
Sputum changing from AFB smear-positive to AFB smear-negative.

Sputum smear examination
A laboratory technique where sputum is smeared on glass slides and stained with an acid-fast stain (e.g. the Ziehl-Neelsen method). Slides are subsequently examined by microscope for AFB presence.

TB
Tuberculosis.

Tuberculin
Purified protein derivative (PPD), a mixture of non-species specific molecules in an extract from a culture filtrate of mycobacteria.

Tuberculin Skin Testing (TST)
Intracutaneous injection of PPD to identify persons who have been sensitized to mycobacterial antigens by infection with *M. tuberculosis*, nontuberculous mycobacteria or administration of BCG.

Tuberculosis
The disease caused by bacteria belonging to the *M. tuberculosis* complex *(M. tuberculosis, M. bovis, M. africanum)*.

United Kingdom
The United Kingdom of Great Britain and Northern Ireland

Universal precautions
Defined measures intended to prevent or reduce the risk of exposure to blood and body fluids.

USA
The United States of America

WHO
World Health Organization.

Approximately one third of the world's population is infected with *Mycobacterium tuberculosis* and tuberculosis (TB) is the leading cause of death from a single infectious agent in adults worldwide.[1] In 1996, 3.8 million new cases of TB were reported to the World Health Organization (WHO), but it is estimated that between seven and eight million cases might have occurred worldwide.[2] Over 95% of these cases occurred in developing countries. The ease and availability of air travel, the large numbers of people travelling yearly, and the movement of immigrants and refugees, all contribute to increase the possibility of being exposed to persons with infectious TB.

For legal immigrants and refugees, most industrialised countries require medical examinations, which as a minimum include screening for TB. Some countries require medical examination also for entering students, persons on temporary work visas, and visitors staying over three months. The timing and the specific requirements of the medical examination vary from country to country. Some countries (e.g. USA, Canada, Australia) require the screening for TB (a chest X-ray for adolescents and adults, and sputum smear examination if the chest X-ray is suggestive of active TB) to be done in the country of origin. Any person with a positive smear examination is not allowed to immigrate. Since these medical clearances may be valid for up to one year (e.g. for immigration to the USA), a person might develop infectious TB in the period between the examination and travel. Other countries (e.g. the United Kingdom, Switzerland, the United Arab Emirates) screen immigrants and refugees when they enter the new country. Thus, these people would be identified as having infectious TB only after their travel.

MILLIONS OF PEOPLE FLY EVERY YEAR. IT IS NOT POSSIBLE TO ASSESS THEM MEDICALLY BEFORE THEIR FLIGHT.

There are limited data on the numbers of immigrants with a diagnosis of infectious TB obtained before they emigrate, i.e. at the time of the required screening in the country of origin. Data on screening in Vietnam revealed that among 39,581 persons emigrating to the USA, Canada, or Australia from 1 November 1992 to 1 June 1993, 322 (0.8%) had sputum smear examinations positive for AFB. These persons were not allowed to travel until they become AFB sputum smear-negative.[3] Only a few immigrants and refugees travelling to the USA or Canada who were screened upon arrival were found to have travelled while infectious. According to a study performed in Seattle, Washington, USA, among 9,328 refugees from Vietnam in 1980 and 1981, upon arrival 36 (0.4%) culture-positive TB cases were diagnosed (information about AFB smear status is not available).[4] From 1982 to 1985, among 21,959 persons emigrating from seven Asian countries to Canada, 3 (0.01%) were found to have smear- and culture-positive pulmonary TB when screened shortly after arrival.[5] Over an 18-month period (July 1992-December 1993), approximately 32,000 immigrants and refugees entered the USA with a stated destination of San

Francisco. Pre-entry screening in Vietnam showed evidence of active smear-negative TB, inactive TB, or healed TB in 893 individuals; smear- and culture-positive TB was diagnosed in three (0.001% of 32,000) cases shortly after entering the USA. [6]

Among 1,936 Vietnamese refugees immigrating to Denmark from 1979-1982, active pulmonary TB was diagnosed upon arrival in 13 (0.7%).[7] Of approximately 140,000 immigrants arriving to the United Kingdom in 1990, 20,000 were referred for further medical evaluation (sputum smear examination and chest X-ray). Active TB was diagnosed in 20 (0.1%) of these.[8] In both studies no information is available about the number of persons potentially infectious during their travel, i.e. having smear- and culture-positive pulmonary disease.

While screening for TB is usually mandatory for immigrants and refugees, the overwhelming majority of passengers flying on commercial aircraft do not fall into any category for which screening for TB is a requirement. For example, in 1994, there were 804,416 legal immigrants and refugees entering the USA and undergoing mandatory medical examination prior to emigrating.[9] In contrast, during the same year, there were almost 97 million passengers on international flights between the USA and the rest of the world; for these, medical examination was not a requirement.[10] In 1997, the total scheduled traffic carried by the airlines of the 185 Contracting States of International Civil Aviation Organization (ICAO) amounted to a total of about 1448 million passengers.[11] ICAO has forecasted more than two billion air passengers by the year 2005.[12] Clearly, medical examination of millions of people travelling by air worldwide would not be possible.

Communicable Diseases on Aircraft

Transmission of foodborne diseases on aircraft, including cholera, shigellosis, salmonellosis, and staphylococcal food poisoning, have been well documented.[13-21] Some investigations of potential transmission of airborne infectious diseases on aircraft have also been conducted. Transmission of smallpox on aircraft was reported in 1965.[22] An outbreak of influenza occurred in 1979 among passengers on a flight that had a three hours' ground delay before takeoff.[23] The influenza attack rate among the passengers was very high (72 %), and was attributed to the ventilation system not operating during the ground delay. Epidemiological investigations have also indicated that measles may have been transmitted aboard international flights.[24-25]

More recently, from 1992 through 1994, the CDC in Atlanta, Georgia, USA, together with state and local health departments, conducted seven investigations involving one flight attendant and six passengers with active TB. Concern was raised that the closed aircraft cabin environment may enhance the transmission of airborne pathogens such as *M. tuberculosis*.[26-31] The number of potentially exposed passengers and crew was more than 2,600, on a total of 191 flights, involving nine different types of aircraft (Boeing 727, 737, 747, 757, 767; McDonnell Douglas DC-9, DC-10; Airbus 300; British Aerospace 146).

TB CAN BE TRANSMITTED DURING AIR TRAVEL. HOWEVER, NONE OF THE INFECTED PERSONS HAS DEVELOPED ACTIVE TB TO DATE.

In each of the investigations, the index patient was considered highly infectious: spontaneous sputum specimens were heavily AFB smear-positive in all seven. In addition, all were culture-positive and had evidence of extensive pulmonary disease on chest X-ray. One patient also had biopsy- and culture-confirmed laryngeal TB, the most infectious form of TB. In two instances, a *M. tuberculosis* strain resistant to at least isoniazid and rifampicin was isolated. [27,30] Organisms isolated from the other patients were susceptible to all antituberculous medications. Two passengers knew that they had active TB at the time of their flights. They were flying to the USA for medical care, but did not inform the airline of their disease. In the other five cases, TB was diagnosed after the flights.

Despite the likely infectiousness of all seven index cases at the time of their flights, only two investigations produced evidence to suggest transmission of *M. tuberculosis* infection: the first from a flight attendant to other crew members, and the second from a passenger to other passengers.[26,30] In the first report, evidence of transmission was limited to crew members with an exposure to the infectious source of at least 12 hours. In the other, transmission was

demonstrated only to a few passengers seated in close proximity to the passenger with active TB, and only on one flight lasting more than eight hours. These results suggest that air travel does not carry a greater risk of infection with *M. tuberculosis* than other activities in which contact with potentially infectious individuals may occur (e.g. train travel, bus travel, attending conferences, etc.). None of the infected persons in the seven studies conducted by CDC has developed active TB to date. Summaries of each of the seven investigations are included in Annex 1.

DIFFICULTIES AND PROBLEMS ENCOUNTERED WHEN CONDUCTING INVESTIGATIONS

The investigations of possible *M. tuberculosis* transmission aboard commercial aircraft were initiated only several weeks to months after the flight. Therefore, passengers were not always easily located. With the exception of passengers enrolled in frequent flyer programmes, airline companies do not maintain passengers' residence addresses or telephone numbers. A telephone number is usually requested at booking. However, as this is not an absolute requirement, the accuracy of the provided information is not known. Telephone numbers collected during the seven above-mentioned investigations were often not valid or were numbers of hotels, and no forwarding address nor telephone number were available. Sometimes it corresponded to a central number of a large national or international travel agency, and tracing back to the actual ticket holder was difficult. Overall, in the airline records, the locating information was inadequate for about 15% of the passengers. Unless an airline requires picture identification, the person whose name is on the ticket might not be the one actually boarding the flight. Whereas with international flights this issue usually does not arise, during the seven investigations it was discovered that some passengers on domestic flights within the USA flew under assumed names or gave their ticket to another person.

FURTHER EPIDEMIOLOGICAL STUDIES ON TB TRANSMISSION IN AIRCRAFT WOULD BE TIME AND RESOURCE CONSUMING. IN CASE OF EXPOSURE TO *M. TUBERCULOSIS* INFECTION DURING AIR TRAVEL, TRACING AND INFORMATION OF PASSENGERS AND CREW MAY BE WARRANTED.

Customs declaration forms (landing cards) are completed by passengers and crew members arriving to the USA on international flights, and request residence address. In the investigations, these forms were used to locate some of the passengers. However, a form is completed for each household and not for each passenger. In addition, because forms are hand-written, it was often not possible to read the passenger's name. Finally, address information was often incomplete or missing. Thus, the usefulness of these forms for follow-up purposes was extremely limited.

The ability to assess tuberculin skin testing (TST) conversion in order to document infection is severely limited when the test is not performed shortly after the exposure. The time elapsing between the notification of the infectious source to the health authorities and the TST of the exposed persons may hinder the assessment of TST conversion in the latter. In the assessment of a positive TST result, beside recent infection with *M. tuberculosis*, other possible reasons must be considered, including prior exposure to TB, residence or birth in countries in which TB is endemic, and BCG vaccination. In the USA, an estimated 4% to 6% of the total population is TST positive. In developing countries the estimated prevalence of *M. tuberculosis* infection ranges from 19% (in the Eastern Mediterranean region) to 44% (in the Western Pacific region).[32-33] In the above-mentioned investigations, foreign passengers

came from countries where TB is endemic and/or where BCG vaccination is routinely used. As a consequence, in these persons a single positive TST result did not represent reliably recent infection.

Each of the seven investigations was extremely labour-intensive, involved a large number of staff, and subtracted time and resources from other priority public health activities. For example, in the investigation by Kenyon et al., approximately three weeks and over 200 hours of staff time were needed to review airline records and to make telephone calls to locate the 1,042 passengers and crew members.[30] To print and mail letters to each person, another week and over 100 hours of staff time were required. Over four months and over 600 hours of staff time were necessary to complete the follow-up phase. This consisted of additional letters, telephone calls, and home visits to ensure that adequate TST screening had been performed and that investigators were provided with TST results; further assessment of persons with positive TST results was also required. Subsequent data entry and analysis took approximately three months. Overall, this single investigation demanded an extensive time commitment for over 30 staff at CDC and at state and local health departments, and took approximately eight months and over 1,200 hours of staff time to be completed.

In conclusion, considering the extensive time commitment required for these investigations and the low risk of *M. tuberculosis* transmission aboard commercial aircraft demonstrated by the seven investigations, additional epidemiological studies do not appear warranted.
A more logical approach in certain situations is to inform passengers and crew of their potential exposure to *M. tuberculosis* and to encourage them to seek further medical evaluation.

Aircraft are expected to comply with the International Health Regulations and the laws of the countries in which they land.[34] Similarly, when transporting infectious agents or persons with infectious diseases, airline companies should follow the laws on safety procedures and on release of passenger information of each country to which they fly. It is beyond the scope of these guidelines to provide details on each country's specific laws and regulations concerning communicable diseases.

When health authorities need to release the name of a passenger with TB to the airline in order to confirm that he/she was on a particular flight(s), a confidentiality issue may rise. In such cases, to ensure patient confidentiality, health authorities should communicate this information to the airline's medical consultant or its designated contact person.

AIRLINE COMPANIES, IN COLLABORATION WITH HEALTH AUTHORITIES, SHOULD INFORM PASSENGERS AND CREW OF THEIR POSSIBLE EXPOSURE TO TB INFECTION.

Confidentiality was also a concern for airline companies when health authorities requested the release of passenger and crew lists. It is recommended that airlines, in collaboration with health authorities, contact their clients and employees and inform them of any potential exposure to TB infection. However, in some cases health authorities may want to retain this responsibility. Sometimes health authorities require names and passenger information for a public health concern due to, for example, the nature of exposure, the need to provide additional medical information to passengers, or the need to collect follow-up information. In such cases, airlines should provide health authorities with names and locating information of passengers and crew members. This will not break confidentiality, since a compelling public health demand overrides any individual confidentiality issue. In addition, in some countries, TB is included among the diseases subjected to laws on transport of infectious persons; all airlines landing in those countries must release passengers' names and locating information upon request of the appropriate health authority.

BOARDING CAN AND SHOULD BE DENIED TO PERSONS KNOWN TO HAVE INFECTIOUS TB.

The captain of an aircraft can legally deny boarding to a person, if he/she has a valid concern that the person is a threat to the safety of the aircraft or of other passengers and crew. In addition, many countries have laws or regulations to prevent persons known to have infectious TB from boarding commercial aircraft. Airlines should inform all passengers of these rules. For example, in the USA boarding has been denied to some patients with infectious TB who were trying to fly

within or to leave the country. In each of these situations, the medical provider informed the relevant health authority of the patient's intention to travel against medical advice; in turn, the health authority notified the involved airlines. Boarding was denied until the patients became non-infectious. In general, health authorities should alert the concerned airline (provided this is known) when a person with infectious TB is planning to travel on a commercial carrier. In these cases, boarding can and should be denied. To avoid false reports of a malicious nature, the airlines should require a written notification from the health authorities rather than from an individual physician.

Persons known to have infectious TB should remain in isolation at home or at hospital, depending on the policies of the national programme, until no longer infectious. When travel is necessary while a person is still infectious, commercial carriers or other public transportation should not be used. Alternative private transportation (e.g. ground transportation, air ambulance, etc.) could be used instead.

PERSONS WITH INFECTIOUS TB MUST NOT TRAVEL BY PUBLIC AIR TRANSPORTATION UNTIL RENDERED NON-INFECTIOUS.

However, TB patients do not always inform health authorities of their intentions. In the USA, CDC have been informed of a few patients with known infectious TB who boarded domestic and international flights, despite the advice to avoid travelling while infectious. To prevent such events, airlines could ask passengers to report on a voluntary basis about any communicable disease they may have, and deny boarding to persons reporting active TB. However, were it known that denying boarding would ensue, it is unlikely that this information will be volunteered. Denying boarding to all patients under treatment would be unjustified, since patients with active TB (provided that they are not infected with multi-drug resistant strains of *M. tuberculosis*) after two weeks of adequate treatment are almost certainly non-infectious[35]. However, since airline staff would be unable to determine which TB patients are still infectious, it would be impossible to deny boarding only to these.

Persons with active TB are often infectious long before they are diagnosed. Therefore, aircraft passengers with undiagnosed active TB will not be identified as infectious prior to boarding. Symptoms of active TB (e.g. cough) are observed also in other conditions, such as other lung diseases, smoking, common viral infections, and allergies. Even if airline staff asked all passengers and crew about such symptoms, it is not appropriate for the airline staff to decide whether or not a person has infectious TB. Unless the passenger was obviously gravely ill or having haemoptysis in the boarding area, it would be difficult to determine that he/she was medically unfit to travel. Thus, passengers with infectious TB are more likely to be identified after, than at the time of, a flight.

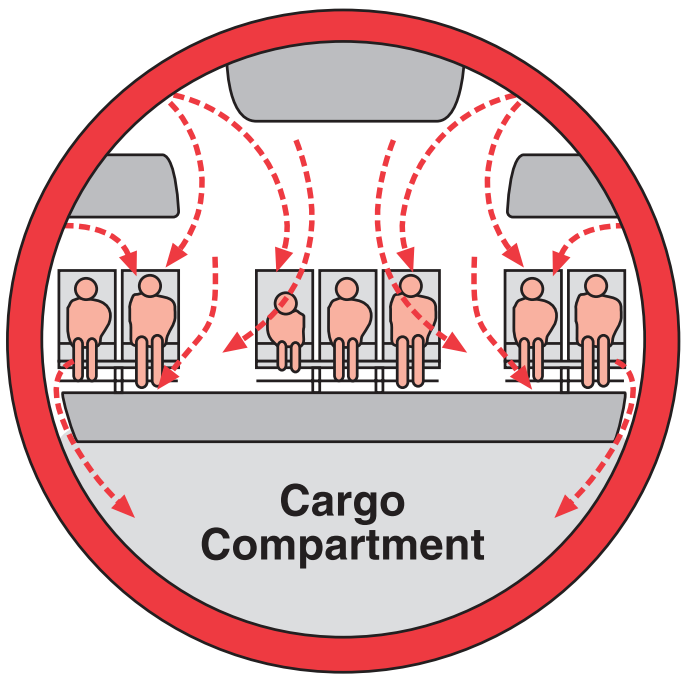
When during a flight a passenger is suspected to have active TB, either because he/she informed the flight attendant or was experiencing haemoptysis, the flight attendants should follow standard universal precautions when handling potentially infectious material (e.g. wear gloves, place material in sealed plastic bags. etc.).[36] T**he ill person should be made as comfortable as possible, given an adequate supply of tissues (towels if necessary), advised to move around the cabin as little as possible, and instructed to cover his/her nose and mouth at least when coughing.** If the person appears severely ill or haemoptysis is present, flight attendants should request the help of the airline ground medical advisor or of any physician who may be on the flight.

Whenever possible, the flight attendants should try to isolate the ill person from other passengers and to devote an area of the aircraft to the ill passenger by moving other passengers. The airport health authorities at the next scheduled stop should be alerted. A medical team escorting the ill person to a medical facility should be requested. **Unless the passenger is in imminent danger of death, it is not necessary to divert the aircraft from its scheduled flight plan for an emergency landing**.

After the aircraft has landed and passengers have disembarked, it is necessary to inspect the aircraft for blood stains, and to clean and disinfect soiled areas before the plane is used again. Other than routine cleaning and replacing carpet and seat cushions that may have been contaminated by blood, disinfection of the whole aircraft for the purpose of preventing TB transmission is not necessary.

While an aircraft is parked at the gate with the engines off, passenger cabin ventilation is supplied by one of the following means: 1) a ground air conditioning unit (preconditioned air source) is connected to the aircraft ventilation system; 2) a ground pneumatic source provides the air required to operate the aircraft environmental control system; 3) the Auxiliary Power Unit (APU) of the aircraft runs the aircraft ventilation system. Once the aircraft has left the gate and the engines have been started, air to the cabin sections is supplied with bleed air from the engines, and the APU is shut down. Outside air enters the aircraft engine compressor section where it is compressed to 28 Kg/m^2 and heated to 200°C. Bleed air enters the aircraft fuselage through high-temperature ducting to the environmental control systems. These cool and condition the air to comfortable levels before introducing it to the passenger cabin. Air is distributed evenly throughout the passenger cabin via ducts running the entire length of the aircraft. Air enters the cabin from overhead distribution outlets located above the windows or in the middle of the ceiling. The airflow is laminar (side to side) with the air flowing downward in a circular pattern towards the outflow grills along both sidewalls of the cabin near the floor (Figure 1). Air enters and leaves the cabin at approximately the same seat row, and airflow in fore and aft directions

Figure 1 Cabin Air Flow Patterns



is minimal. The movement of passengers and crew in the cabin have minimal impact on the intended air flow patterns.

The ventilation systems of jet aircraft function optimally during flight. During takeoff and landing airflow is decreased. When the plane is delayed on the ground, there may be little or even no ventilation or air movement. An influenza outbreak on an aircraft was greatly facilitated by a ground delay lasting three to four hours, during which the ventilation system was not operating and the passengers were not receiving fresh air.[23] Thus, ground delays away from the gate must be kept as short as possible. When such delays are inevitable, provisions should be made to supply adequate ventilation.

A study by the USA Department of Transportation stated: "If the ventilation system is not operating, passengers should not stay aboard the plane for long time periods (i.e. greater than 30 minutes)".[37]

IN CASE OF GROUND DELAYS OF MORE THAN 30 MINUTES, PROVISIONS MUST BE MADE TO SUPPLY ADEQUATE VENTILATION ON BOARD.

Although older aircraft (built before the late 1980's) typically do not recirculate air, some have been adapted in order to do so. All the new commercial jet aircraft recirculate air: from 10% to 50% of cabin air is filtered, mixed with fresh conditioned bleed air from the engine compressors, and reintroduced into the passenger cabin. Depending on the type of aircraft, recirculation of air may be done throughout the entire plane from one common plenum or only within zones. For example, Boeing 747 has multiple heating and air conditioning zones, but one common plenum is used to recirculate air for the entire plane. Thus, air from the back of the plane may be recirculated to the upper deck of 1st class. In contrast, Airbus-300, which also has multiple heating and air conditioning zones, recirculates air within each zone separately. All large commercial jet aircraft (both those that recirculate air and those that do not) provide approximately 0.57 m^3/min of air per occupant (about 20 air exchanges per hour) during cruising. During descent and on the ground around 0.2 m^3/min per occupant are provided.

When recirculated, the air passes through a set of filters before being mixed with fresh conditioned air and prior to re-entering the passenger cabin. Generally, the first filter (or prefilter) traps the largest particles. Subsequently, on most modern aircraft, before re-entering the passenger cabin, the air passes through high-efficiency particulate air (HEPA) filters, which capture material as small as 0.3 microns. The tubercle bacillus is approximately 0.5 to 1 micron in size. Therefore, HEPA filters would remove any *M. tuberculosis* organisms from the recirculating air, thus reducing the risk of exposure for passengers and crew members.

Complaints from passengers and crew about fatigue, dizziness, headaches, sinus and ear problems, dry eyes and sore throats are not uncommon following air travel. This discomfort can be attributed to a number of factors, such as long duration of flight(s), crowding, noise, limited ability to move (ambulate) on the aircraft, jet lag, inability to sleep, and the very low humidity of cabin air.

Cabin air is dry because outside air at cruising altitude has extremely low water content. Humidity of cabin air is usually between 10% and 20%, similar to that of ambient air in desert environments, but much lower than in most homes or office buildings, where humidity levels are maintained between 40% and 60%. This contributes to discomfort of travellers with respiratory problems (e.g. asthma), as well as to the common feeling of a dry/sore throat and dry eyes. Recirculating cabin air helps to maintain higher humidity levels in the cabin air.

Airlines in general meet Occupational Safety & Health Administration (OSHA) and Federal Aviation Administration (FAA) standards for carbon dioxide (CO_2). In a study on CO_2 levels on aircraft, average measurements were generally within standards.[37] However, during ascent and descent, and when the aircraft was on the ground, measurements exceeded acceptable levels (although these were originally calculated for building ventilation standards). This might contribute to some passengers' discomfort, such as headache, fatigue and dizziness. In addition, ozone levels in cabin air may cause conjunctival and respiratory irritation on some routes or during some seasons. Recirculation of cabin air and the use of on-board ozone converters may mitigate these symptoms.

Changes in air pressure during ascent and descent of aircraft can cause ear or sinus blocks or general ear discomfort.

In the past few years, media, airline crew, and passengers have expressed their concern about health risks to passengers and crew relating to air contaminants and air recirculation on aircraft. At cruising altitude, outside ambient air is virtually free of microorganisms. When the aircraft is on the ground, outside air entering the aircraft may contain a wide variety of microorganisms, including viruses, bacteria, and fungi. However, outside air usually passes through HEPA filters before entering the cabin, and microorganisms greater than or equal to 0.3 microns in size would be removed. A few studies have examined microbial contaminants in aircraft cabin air.[37-39] No evidence was found that microbial contamination of cabin air entails a greater risk of disease transmission aboard a commercial aircraft than in any other public milieu. Low concentrations of bacteria and fungi were found (sometimes lower than those found in other public places or in private houses) at levels which are not thought to pose any health risk. This was attributed to the sterility of the air entering the aircraft at cruising altitude, to the high airflow rates and the laminar airflow pattern in the passenger cabin, and to the high-efficiency filters used for recirculating air.
Persons on the plane are the most important source of any microbial

aerosols in the cabin air. If a person with infectious TB is on the aircraft, droplet nuclei containing *M. tuberculosis* are aerosolized in the cabin air when the person with TB coughs or sneezes, or, in the case of laryngeal TB, when he/she talks. Droplet nuclei will then follow the airflow in the passenger cabin. If there is no airflow, as during the influenza outbreak, microorganisms can remain dispersed in the air for some time.[23] In most modern aircraft, however, when the ventilation system is operating, air is recirculated and filtered at high rate, and any airborne particles would be rapidly removed. A study examining bacterial levels in cabin air demonstrated that within three minutes after a sudden increase in bacterial concentration (e.g. after a cough or a sneeze) all measurements were back to normal levels.[38]

THERE IS NO EVIDENCE THAT AIR RECIRCULATION FACILITATES TRANSMISSION OF *M. TUBERCULOSIS* ABOARD.

The seven investigations of possible transmission of *M. tuberculosis* on aircraft found no evidence that air recirculation facilitated transmission of *M. tuberculosis* aboard aircraft. In the only investigation documenting probable passenger-to-passenger transmission of *M. tuberculosis*, infection was reported only for a few passengers seated in the same section of the aircraft.[30] The aircraft used on this flight recirculated up to 50% of the air in the passenger cabin throughout the entire aircraft, and air from the rear section is recirculated in the first class section. If recirculation of air enhanced transmission of *M. tuberculosis*, TST conversions would be expected in passengers seated throughout the aircraft. Also, in the investigations of measles transmission on aircraft, only passengers seated within a few rows from the ill passenger were infected.[24-25]

Airborne transmission of infectious diseases in aircraft appears to be limited to person-to-person spread within close proximity.

PROCEDURES FOR INFORMING PASSENGERS AND CREW

Based on the best available data, in most instances tracing and informing passengers of potential exposure to *M. tuberculosis* is not necessary. The following are guidelines to assist health authorities in determining when and how passengers and crew should be informed of their possible exposure to infectious TB on commercial flights (Figure 2). Health authorities and airline medical consultant(s) should work together to determine whether and which passengers and/or flight crew should be informed of possible exposure. In all situations, health authorities should make the final decision.

COMMUNICATION BETWEEN HEALTH AUTHORITIES AND AIRLINES.

In each of the seven investigations conducted in the USA, the health department was informed of an active TB case (flight attendant or passenger) before the airline. Should the airline be informed first, e.g. by the person with active TB or by the physician treating the person, the airline should obtain the physician's name, address, and telephone and fax numbers, and immediately communicate all information to the health authorities in the county, state, or country of the person with active TB. In these cases, health authorities must confirm that the person has active TB before any further action is considered.

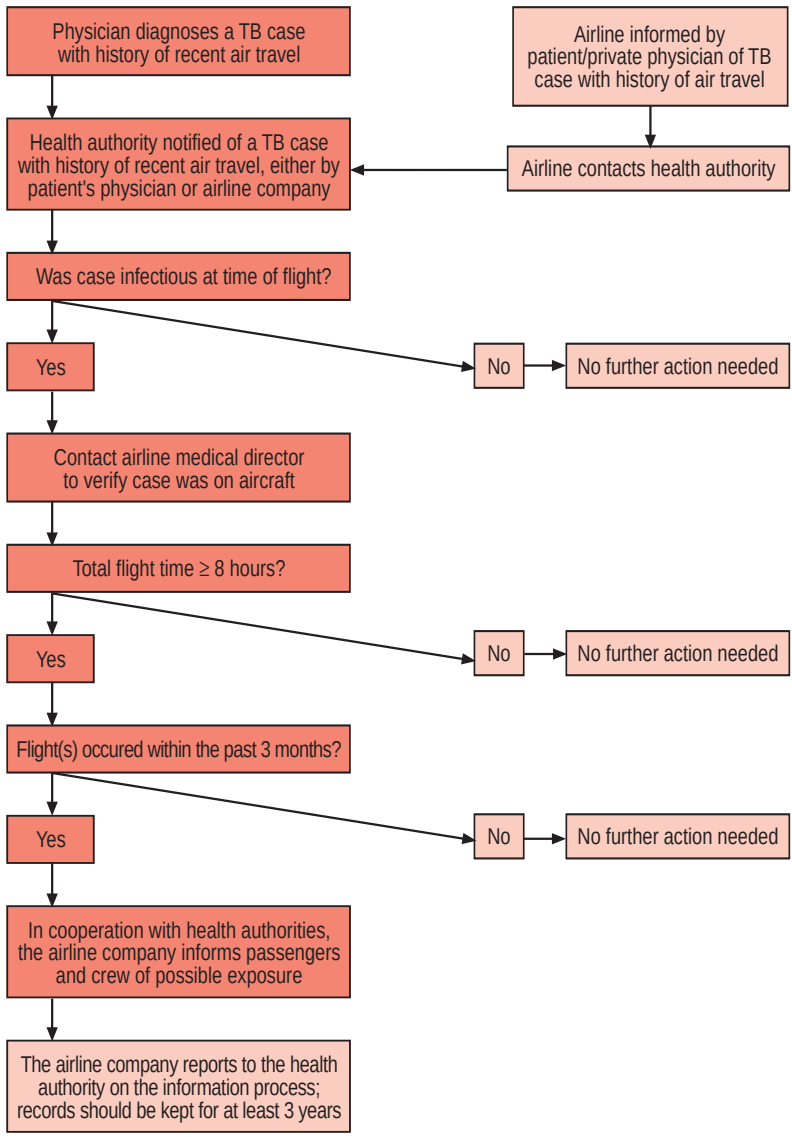
CRITERIA TO DECIDE WHETHER TO INFORM PASSENGERS AND CREW.

Once notified, either by the treating physician and/or by the airline company, of a passenger with potentially infectious TB, health authorities must evaluate the risk of *M. tuberculosis* transmission and decide whether to inform passengers and flight crew of the potential exposure. To this purpose, the following criteria should be used: A) infectiousness of the person with active TB; B) duration of the flight; C) time interval between the flight and the notification of the case to the health authorities; and D) proximity of the exposed persons to the index case.

A. Determination of infectiousness

Tracing and informing passengers and crew of potential exposure to M. tuberculosis is recommended if the person with active TB is likely to have been infectious at the time of the flight(s). The infectiousness of the index case is to be assessed by the relevant health authorities**. For the purpose of determining infectiousness of a case of pulmonary or laryngeal TB with a recent history of air travel, patients should be considered infectious at the time of the flight(s) if all the following conditions are met**:

Figure 2 Flowchart summarizing the recommended procedures for deciding whether tracing and informing of passengers and crew are needed



a at diagnosis:

1. they have positive AFB smears from sputum specimens*

AND

2. they have positive cultures for *M. tuberculosis** (in settings where culture facilities are available)#

AND

b at the time of the flight(s):

1. they were symptomatic with a cough (not required for persons with laryngeal TB)

AND

2. they were not receiving treatment for TB, or treatment had been started but they had no evidence of response (e.g. no documentation of sputum smear conversion from AFB smear-positive to AFB smear-negative).

B. Duration of Exposure

In the seven investigations, evidence for *M. tuberculosis* transmission was only found for exposure to the person with active TB ***longer than eight hours***. Therefore, health authorities and airline medical consultants may consider informing only passengers and crew on flights of at least eight hours' duration. Ground delays after boarding, flying time, and ground delays after landing must be taken into account in determining the actual flight duration. After the health authorities have concluded that the person was likely to have been infectious at the time of the flight(s), they should immediately contact the medical consultant or other designated person of the airline with which the person travelled, to:

1. **confirm that the person with active TB was on the flight(s) in question**
2. **determine the duration of the flight(s) (in-flight or flight time), including any ground delays after boarding and/or after landing.**

If these two conditions are met, the health authority should send an official letter to the airline company to request action. A sample letter is attached (Annex 2).
In case the infectious TB patient utilized more than one airline company, the health authority should contact all the airlines which transported the patient.

* If no spontaneous sputum specimens are obtained, positive sputum smear AND positive culture from a bronchoscopy specimen may be considered evidence of infectiousness.
# A positive culture result is required to confirm the diagnosis of TB and the need to proceed with tracing and informing exposed persons. In settings where culture facilities are not available, a positive sputum smear examination will be sufficient to provide evidence of TB in order begin the notification and information process.

C.Time elapsed between flight(s) and notification to health authorities

In some cases, between diagnosis of active TB and recognition that the person with infectious active TB was on commercial flight(s), delays may occur. Computerized records of passenger lists are generally maintained by the airline for about three months after the flight. After this time, records are often not retrievable. The time elapsing between the flight and the notification of the infectious source to the health authorities (and the subsequent TST of exposed passengers and crew members) may hinder the assessment of TST conversion in the exposed persons. In addition, determining retrospectively whether a person with TB was symptomatic at the time of the flight(s) can be very difficult, and the reliability of the information will be related to the time interval between the flight and the diagnosis of active TB. Therefore, informing passengers and crew should be limited ***to flights that have occurred within three months prior to the notification of the TB case to the health authorities.***

D. Proximity to persons with infectious TB

As described in chapter 8, the aircraft ventilation systems are designed to limit the movement of air in fore and aft directions. Additionally, studies documented passenger-to-passenger transmission of *M. tuberculosis* only among passengers sharing the same cabin area as the person with active TB.[30] Because of these findings, ***informing only those passengers seated close to the person with active TB and crew members working in the same cabin area will usually be adequate***. However, depending upon the duration of ground delays, the activities of the infectious TB person aboard, and the specific seating configuration of the aircraft involved, in some instances a larger number of passengers and crew need to be informed.

Instances when informing passengers and crew is not indicated
Informing passengers and crew is NOT indicated when the person with TB has negative sputum smears and/or negative cultures, or when in-flight time was less than eight hours. Also, informing passengers is NOT indicated if the infectious source is one of the cockpit crew members (i.e. pilot, co-pilot, navigator), because usually there is no contact between passengers and cockpit crew and because in most aircraft the ventilation system for the cockpit is completely separate from the system for the passenger cabin.

PROCESS FOR INFORMING PASSENGERS AND CREW

The necessary information to locate passengers and crew is maintained by each airline. However, because the above-mentioned investigations found that airline records did not have locating information for up to 15% of passengers, airline companies should modify their booking systems to require home addresses and telephone numbers for all passengers. Airlines usually have a system in place to reach passengers and inform them of flight cancellations, flight changes, etc. Thus, unless the country policy mandates that public health authorities maintain direct contacts with the exposed persons, the airlines, **in cooperation with the relevant health authorities**, should be the party informing passengers and crew of their potential exposure to *M. tuberculosis*. Broadcasting an alert is not warranted in this context.

WHEN IT IS DECIDED THAT TRACING AND INFORMATION OF EXPOSED PERSONS ARE NEEDED, THOSE WHO ARE INFORMED SHOULD BE ENCOURAGED TO SEEK MEDICAL EVALUATION TO DETERMINE WHETHER THEY MAY HAVE BEEN INFECTED WITH *M. TUBERCULOSIS* AND TO ASSESS THE NEED FOR ISONIAZID PREVENTIVE THERAPY.

Airline companies should contact all the persons who can be located, to explain the potential exposure, reassure on the low risk of TB transmission, and encourage them to seek medical evaluation to determine whether they may have been infected with *M. tuberculosis* and to assess the need for isoniazid preventive therapy. The telephone number of the health authorities to which the index case has been notified should be included, in case passengers and crew members need further information. The airline medical consultant's telephone number might be added. Whenever possible, airline companies should provide the exposed persons with written information, e.g. a letter or a fax, drafted in cooperation with the appropriate health authority. A sample letter is attached (Annex 3). It is also advisable to include some basic information about TB. The health authorities should have educational materials on TB available upon request.

IT IS RECOMMENDED THAT AIRLINE COMPANIES, IN COOPERATION WITH PUBLIC HEALTH AUTHORITIES, BE RESPONSIBLE TO INFORM PASSENGERS AND CREW OF THEIR POTENTIAL EXPOSURE TO TB INFECTION.

In most situations, health authorities are informed that a person with infectious TB flew on a commercial aircraft weeks to months after the flight. This often impairs the assessment of TST conversion in the exposed persons. To avoid further delays, health authorities and airline

companies should work together to ensure that passengers and crew members are traced as soon as possible after it is determined that informing them is indicated. Health authorities may want to monitor the process of informing passengers; they may also need to determine whether persons claiming to have been exposed to active TB aboard a commercial aircraft were informed or not (e.g. because locating them had been impossible). Therefore, the airlines should keep a list of all passengers and crew on the flight(s) in question, including the persons that have not been traced or informed, for three years, and share it with the health authorities if requested.

When the infectious source is a crew member (flight attendant or pilot), an assessment of individual work assignments should be made. All crew members with ***a cumulative exposure of at least eight hours*** during the period when the person with TB was potentially infectious should be informed of their exposure and advised to seek medical evaluation. They would be considered "close contacts" because they are exposed to the infectious source while working, travelling, and socializing together when away from their home base.

Available data about transmission of *M. tuberculosis* on aircraft do not suggest an increased risk for flight attendants resulting from their work, and thus routine and periodic tuberculin screening of all flight crew is not justified nor indicated for otherwise asymptomatic employees.

RISK OF TB AMONG FLIGHT ATTENDANTS IS SIMILAR TO THAT OF THE GENERAL POPULATION. NO MANDATORY ROUTINE OR PERIODIC TB SCREENING IS INDICATED FOR FLIGHT CREW.

All flight crew should receive training about potential exposure to infectious diseases during flight and while in a foreign country. Additional protective measures should be taken in accordance with local national policies.

Flight crew and cabin service personnel should be trained to use universal precautions when there may be exposure to body fluids.[36] Airlines should ensure that gloves, HEPA masks, and biohazard disposal bags are readily available on all aircraft.

FOR TRAVELLERS

1. Persons with infectious TB should postpone travel until they become non-infectious.

FOR PHYSICIANS AND HEALTH AUTHORITIES

2. After assessing a recent (i.e. within three months) history of air travel in a patient with suspected or confirmed active TB, physicians should immediately inform the health authority, in addition to submitting the required notification for a TB case.
3. Health authorities should promptly contact the airline company if a person with infectious TB is known to have travelled on commercial aircraft in a flight of at least eight hours' duration within the preceding three months.

FOR AIRLINE COMPANIES

4. Airline companies should cooperate fully with health authorities in determining whether informing passengers and crew of potential exposure to *M. tuberculosis* is indicated and which passengers to inform.
5. Airline companies should cooperate fully with health authorities in informing passengers and crew when potential transmission of *M. tuberculosis* is suspected.
6. In order to inform promptly passengers of any potential health risk (exposure to *M. tuberculosis* or other infectious diseases, exposures to toxins, etc.), airline companies should require home or work addresses and telephone numbers for all passengers.
7. Airline companies should ensure that all crew receive adequate training in first aid and in using universal precautions when there may be exposure to body fluids. They should also ensure that adequate emergency medical equipment/supplies are on all aircraft (including gloves, HEPA masks, and biohazard disposal bags).
8. Airline companies should have pre-arranged access to physicians with expertise in communicable diseases who are readily available to consult with health authorities.
9. Records of all illnesses and medical emergencies occurring aboard should be kept for at least three years.
10. Ground delays should be kept at a minimum, and HEPA filters with maximum efficiency (99.97% at 0.3 microns) should be installed and properly maintained on all aircraft.

Investigation 1.

A flight attendant had documented TST conversion in 1989, but had not received preventive therapy.[26] While working on numerous domestic (within the USA only) and international flights from May through October 1992, she developed a progressively severe cough. Pulmonary TB was diagnosed in November 1992. TST was performed on 212 crew members who worked with the flight attendant from May through October and 247 unexposed flight crew. Flight crew exposed to the flight attendant during August through October were more likely to have a positive TST than crew exposed from May through July (30.2% vs. 5.9%, $p<0.01$) or than unexposed flight crew (1.6%, $p<0.01$). Two crew members exposed in August and October, respectively, had documented TST conversions. TST positivity and conversions were not associated with aircraft type, but were associated with exposure to the flight attendant with active TB on flights longer than 12 hours. Skin test reactivity was assessed in 59 passengers registered in the airline's frequent flyer programme who had travelled during August through October 1992 on flights attended by the index case. Of these, four (6.7%) were TST positive; all had travelled in October. The investigation found that the index case transmitted *M. tuberculosis* to other members of the flight crew, but evidence of transmission to passengers was inconclusive.

Investigation 2.

During 1993, the Minnesota Department of Health conducted an investigation on a foreign-born passenger with pulmonary TB who travelled in the first class section of an aircraft during a nine-hour flight from London to Minneapolis, in December 1992.[27] Of the 343 crew and passengers on the aircraft, TST results were obtained for 59 (61%) of 97 USA citizens and for 20 (8%) of 246 non-USA citizens. Eight persons (10%) had positive TST; all had received Bacille Calmette-Guérin (BCG) vaccine or had a history of past exposure to *M. tuberculosis*. The investigation found no evidence of transmission of TB during the flight.

Investigation 3.

In March 1993, a foreign-born passenger with pulmonary TB travelled on a 1.5-hour flight from Mexico to San Francisco.[28] Ninety-two passengers were on the flight. Of these, 17 (18%) could not be traced. TST results were positive in 10 (45%) of the 22 persons who were contacted and completed screening; nine of these were born outside the USA. The tenth was a 75-year-old passenger who lived overseas for an extended period of time and was likely to have acquired *M tuberculosis* infection either while overseas or at a younger age, i.e. when TB was prevalent in

the USA. The San Francisco Department of Health found no conclusive evidence of *M. tuberculosis* transmission during this flight.

Investigation 4.

In March, 1993, a refugee from the former Soviet Union with pulmonary TB travelled from Frankfurt, Germany, to New York City, USA, on an 8.5-hour flight and subsequently to Cleveland, Ohio, on a 1.5-hour flight.[29] Of the 219 passengers and flight crew, 169 (77%) USA-residents were contacted. Of these, 142 persons (84%) completed TST screening. Results were positive in 32 (23%), including 5 converting from negative result on initial post-exposure TST to positive on follow-up testing. Twenty-nine of the TST positive persons, including the five with TST conversions, had received BCG or were born and had resided in countries where TB is endemic. The five passengers with TST conversions were seated throughout the plane; none sat near the passenger with TB. Since none of the USA-born passengers on this flight had TST conversions, the investigation concluded that, although transmission could not be excluded, the positive TST and conversions were probably associated with prior *M. tuberculosis* infection, a boosted immune response from prior exposure to TB, or prior BCG vaccination.

Investigation 5.

In March 1994, a USA citizen with pulmonary TB and an underlying immune disorder who had resided for a long time in Asia travelled on flights from Taiwan to Tokyo (three hours), to Seattle (nine hours), to Minneapolis (three hours), and to Wisconsin (0.5 hours).[28] Of the 661 passengers on these four flights, 345 (52%) were USA-residents and were contacted. The Wisconsin Division of Health received reports on TST results from 87 (25%) passengers. Of these, 14 (17%) had a positive test; all had been seated more than five rows away from the index case, and nine were born in Asia (including two with known prior positive TST). Of the five born in the USA, one had a positive TST prior to the flight, two had resided in a country with high TB incidence, and two were older than 75 years. The investigation concluded that, although transmission of *M. tuberculosis* during flights could not be excluded, the positive TST may have resulted from prior *M. tuberculosis* infection.

Investigation 6.

In April 1994, a foreign-born passenger with pulmonary TB travelled on flights from Honolulu to Chicago (seven hours 50 minutes) to Baltimore (two hours), where she lived with friends for one month.[30] During that time, her symptoms worsened and she returned to Hawaii via the same route. Of the 925 USA-resident passengers and crew members, 802 (87%) completed TST screening. Of these, 94% were USA-born. No evidence of transmission was found on the flights from Honolulu to Chicago and from Chicago to Baltimore. Of the 113 persons who had travelled from Baltimore to Chicago with the index case, three (3%) had a positive TST; two were foreign-born. Of the 257 persons who travelled from Chicago to Honolulu (eight hours 38 minutes), 15 (6%) were TST positive, including 6 who converted. Of the six persons who converted, two had a boosted immune response; four were USA-born and sat in the same section of the plane of the index case. Because of TST conversions occurred among USA-born passengers, passenger-to-passenger transmission of *M. tuberculosis* probably occurred.

Investigation 7.

In July 1994, a passenger with pulmonary and laryngeal TB flew from Canada to Los Angeles to Phoenix and returned one month later via the same route.[31] Because investigation in Canada had documented extensive transmission among family and social contacts of this case and because of the highly infectious nature of laryngeal TB, the Arizona Department of Health investigated the two short flights between Los Angeles and Phoenix, each lasting about 75 minutes. All 15 crew and 146 of the 212 USA resident passengers on the flights were contacted. Results of TST were received from 90 (62%) of the 146 passengers and from 10 (67%) of the 15 crew members. Five passengers had positive TST results. All had other possible explanation for a positive TST result, including BCG vaccination, birth in a country with high rates of TB, a family member with active TB, and extensive travel in areas of the world where TB is endemic. The passengers with positive TST were seated throughout the plane and none were within five rows of the index case. It was concluded that, in spite of the high infectiousness of the index case with laryngeal TB (also demonstrated by the extensive transmission documented in Canada), the likelihood of *M. tuberculosis* transmission on these two flights was low.

ANNEX 2

SAMPLE LETTER: HEALTH AUTHORITY ASKING AIRLINE COMPANIES TO TRACE AND INFORM PASSENGERS AND CREW OF POSSIBLE EXPOSURE TO *M. TUBERCULOSIS*

(*N. B.*: this official letter should normally be sent only after the health authority has confirmed with the airline company that a TB patient was on board and that the flight lasted more than eight hours).

Date _____

Airline medical consultant's address

Dear Colleague,

We have recently been notified of a case of active **[pulmonary or laryngeal]** TB with a recent history of air travel. This patient has been judged to be infectious at the time of flight, since he/she met all to the following criteria:

1. he/she has positive AFB smears from sputum specimens
2. he/she has positive cultures for *M. tuberculosis*
3. at the time of the flight(s) he/she was symptomatic
4. at the time of the flight(s) he/she was not receiving treatment for TB, or treatment had been started but he/she had no evidence of response

The patient **[NAME_____]** reported flying from **[town of departure]** to **[town of landing]** on **[date]** on your flight **[flight details - flight number - as precise as possible]**.

This flight itinerary was confirmed by your airline. Additionally, it was confirmed by your airline that the flight in question was longer than **[eight hours]** duration.

There is some evidence that transmission of *M. tuberculosis* may occur during long (i.e. more than eight hours) flights, from an infectious source (passenger or crew member) to other passengers or crew members.[1,2]

Thus, **all cabin crew members** who were on the flight in question and at least **all passengers seated in the same cabin area** of the infectious case are to be considered *flight contacts* and potentially exposed to TB. The airline company, with which the patient flew, should inform all *flight contacts* by telephone and in writing of their potential exposure to TB, reassure on the low risk of TB transmission, and encourage to seek medical evaluation to (i) determine whether they may have been infected with *M. tuberculosis* and (ii) assess the need for isoniazid preventive therapy. For further information, *flight contacts* may call the following telephone number: **[name and telephone number of the health authority]**. A sample letter to the *flight contacts* is attached. If you deem it appropriate, you might also indicate the telephone number of your medical consultant.

It is also advisable to include in the letter some basic information about TB. We will provide you with educational materials if needed.

To monitor the tracing and information process, we request that you keep a record of all passengers and crew on the flight(s) in question, including the persons that were not traced or informed, for at least three years.

Yours sincerely,

[Name, Address, Telephone/Fax Number of Health Authority]

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ANNEX 3

SAMPLE LETTER: AIRLINE COMPANY INFORMING PASSENGERS AND CREW OF POSSIBLE EXPOSURE TO *M. TUBERCULOSIS*

Date _____

Address of person

Dear _____,

This letter is to inform you that we have become aware that a person on _____ **(name of airline)** Airlines flight _____ **(flight number)** from _____ to_____ **(origin and destination cities)** on _____ **(date of flight)** has been diagnosed with active pulmonary tuberculosis (TB). Our records show that you were a passenger or crew member on this flight and may have been exposed to TB.

TB is spread through the air when a person with TB coughs TB bacteria into the air where others may inhale them. Results of investigations that have been conducted indicate that the risk of TB transmission on aircraft appears to be very low.

TB is preventable and can be cured, but proper diagnosis and treatment are important. You should contact your local health authorities or your physician to determine whether you should be evaluated because of this possible exposure. It is especially important for you to see your doctor if you have a weakened immune system because of chemotherapy for cancer, HIV infection or AIDS, renal dialysis, steroids therapy or other medical problems that weaken the immune system. Please bring this letter with you when you go to see your doctor.

A tuberculin skin test can show whether you have TB infection. In some cases, if the result of your skin test was negative, a second test will be necessary. Your doctor will determine if a second test is indicated. If your tuberculin skin test result is positive, it might indicate that you have been infected with TB at some time in your life and your doctor may recommend a chest x-ray for further evaluation and may also prescribe antibiotic medication. A positive test result does not indicate when infection occurred, and it does not mean that you are sick with TB disease. People with TB infection but not TB disease cannot spread TB to others.

Enclosed you will find additional information about TB and the skin test. If you have any further questions, please contact

_____

(contact name and phone number of health authority)

Sincerely yours,

_____

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