

## The Air We Share: Principles and Practices of TB Infection Control

Session Four of a Four-Part Webinar Series  
Presented in Partnership with the  
BC Lung Association

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### Overview

- Review of relevant information from webinar series presentations
- Foundations of TB infection prevention and control measures
- Key concepts and practices
- Suggestions for ensuring supportive and safe home isolation
- FAQs
- TB and smoking – Veda Peters, BC Lung Assoc.
- Q&A



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### Learning Objectives

After this webinar, participants will be able to:

- Explain the principles of TB isolation
- List factors considered in determining whether a TB patient is infectious
- Describe ways to reduce risk of TB transmission in hospital, clinic and community settings



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### Learning Objectives (con't)

After this webinar, participants will be able to:

- Describe ways to ensure supportive and safe home isolation
- Identify synergies between TB prevention, care and control programs and tobacco cessation programs



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### Abbreviations and Key Terms

- **TB bacteria:** bacteria that can cause TB disease
- **LTBI:** latent TB infection
- **AIIR:** airborne infection isolation room
- **HCW:** health care worker



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## Part One: Review



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### What is Tuberculosis (TB)?

- An infectious disease
- Often (but not always) attacks the lungs
- Usually (but not always) curable with appropriate treatment
- Untreated, can be fatal
- Typically, only cases with respiratory disease transmit


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### Signs and Symptoms of **RESPIRATORY** TB

- Cough for > 3 weeks
- Weight loss
- Night sweats
- Fatigue
- Fever
- Hemoptysis (bloody sputum)
- Chest pain


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### Types of TB Disease

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    A[TB disease] --> B[Non-respiratory TB  
(~25% of cases)]
    A --> C[Respiratory TB  
(~75% of cases)]
    B --> D[infectious droplet nuclei  
can be released under  
some circumstances]
    C --> E[typically infectious  
prior to treatment]
    
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### What Causes TB?

***Mycobacterium tuberculosis* complex:** several closely related mycobacteria that cause TB disease

- *M. tuberculosis* including MTB subspecies, *canetti*
- *M. bovis*
- *M. africanum*
- *M. caprae*
- *M. microti*
- *M. pinnipedii*




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### How Common is TB? TB in British Columbia (2011)

| Origin                       | Cases |
|------------------------------|-------|
| Foreign-born                 | 194   |
| Aboriginal*                  | 26    |
| Canadian-born non-Aboriginal | 34    |
| Other and Unknown            | 15    |
| BC Total                     | 269   |

\* Includes Registered and Non-registered aboriginal, both on- and off-reserve

Source: BCCDC, F. Hutton, April 4, 2013




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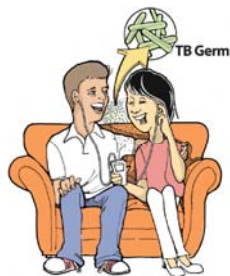
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### How is TB Transmitted?

When a person with infectious **TB disease** coughs, sneezes, sings or shouts, TB germs are passed into the air in "droplet nuclei".



People become infected with TB germs by inhaling droplet nuclei.




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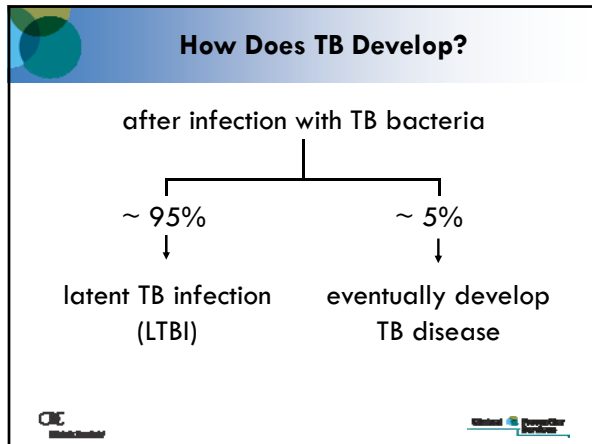
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### Latent TB Infection (LTBI)

The term 'LTBI' is used to describe the situation when a person is infected with TB bacteria but has not developed TB disease.

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### What are the Important Differences between LTBI and TB Disease?

| LATENT TB INFECTION   | TB DISEASE   |
|---|--|
| • TB bacteria in the body; bacteria are <b>inactive</b> (latent)              | • TB bacteria in the body; bacteria are <b>active and multiplying</b>  |
| • Does not feel sick; no symptoms   | • Feels sick; symptoms such as fever, weight loss, fatigue             |
| • <b>NOT contagious</b>   | • <b>Could spread TB bacteria if contagious</b> form of disease        |
| • Could develop TB disease if TB bacteria become active and begin to multiply | • Almost always curable if diagnosed in time and treated appropriately |
| • Treatment can <b>PREVENT</b> development of TB disease in future            |  |

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**Preventing TB –  
Treatment of LTBI**



**People with LTBI cannot  
transmit TB bacteria.**

However, they remain at risk  
for developing TB disease  
unless they complete  
treatment for LTBI.

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**Preventing Transmission –  
Objectives of Treatment of TB Disease**

1. Rapid killing of TB bacteria improves clinical condition of the patient and prevents:
  - Complications
  - Death
  - **Ongoing transmission**
2. Prevents development or worsening of TB drug resistance
3. Prevents relapse (ensures life-long cure)

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**Preventing Transmission –  
Treatment of TB Disease**

Treatment for TB disease is given in two phases:

1. **Initial (intensive) Phase:** Multiple drugs (INH, RMP, PZA, EMB) used in combination for at least 2 months, preferably given as daily doses.
2. **Continuation Phase:** Minimum of two drugs (INH, RMP) given in combination. Dosing can be daily or intermittent. Duration of continuation phase is variable, 4 months minimum. Often it can take a number of months to determine appropriate length of treatment.

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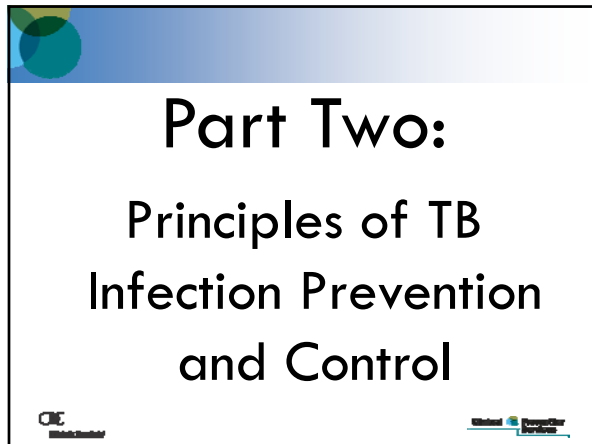
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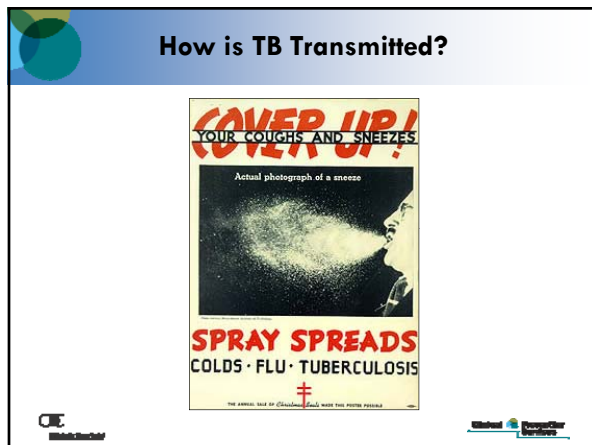
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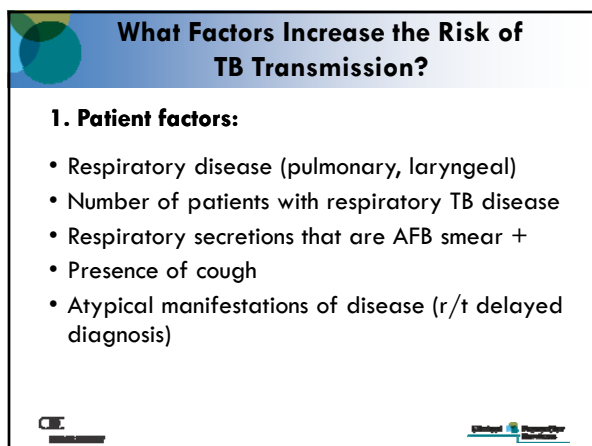
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### What Factors Increase the Risk of TB transmission?

**2. Diagnostic/laboratory factors:**

- Cough inducing procedures
- Delayed diagnosis
- Autopsy and preparation of pathology specimens
- Improper handling of laboratory specimens containing *M. tuberculosis*

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### What Factors Increase the Risk of TB Transmission?

**3. Environmental factors:**

- Inadequate ventilation to remove airborne droplet nuclei containing TB bacteria (see CTS7)
- Inadequate TB infection prevention and control measures
- Duration of exposure and proximity to infectious TB patients
- Overcrowding (e.g., shelters)
- Absence of sunlight (UV light), high humidity

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### TB Transmission – Droplet Nuclei

Large Infectious Droplets: 1-3 Feet

Small Infectious Droplets: 3-5 Feet

Infectious Droplet Nuclei: 5-160+ Feet

Droplet nuclei (more dangerous) can remain suspended for hours and...

Larger droplets settle to the ground more quickly (less dangerous)

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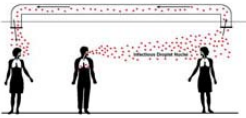
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### TB Transmission – Droplet Nuclei



...droplet nuclei can travel on air currents!

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### What Factors Increase the Risk of TB Transmission?

**4. Treatment factors:**

- Incorrect therapy (e.g., dosing)
- Ineffective therapy (e.g., prior to confirmation of drug susceptibilities)
- Absence of therapy (e.g., non-adherence)
- Delayed treatment

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### What is Necessary to Prevent and Control TB Transmission?

Hierarchical approach:

1. Administrative controls
2. Environmental (engineering) controls
3. Personal protection controls

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### 1. Administrative Controls

Policies or measures to provide overarching protection for all HCWs, patients/residents, and visitors.

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### Administrative Controls - Examples

Policies and procedures related to:

- Rapid identification, isolation and treatment of patients with suspected or confirmed TB disease
- Use of appropriate environmental controls
- Occupational health programs for TB
- Use of personal protective equipment
- Provision of education for HCWs

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### 2. Environmental Controls

Environmental measures to reduce likelihood of exposure to viable airborne TB bacteria.

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**Environmental Controls - Examples**

Appropriate provision of:

- Mechanical ventilation systems
- High-efficiency particulate air (HEPA) filters
- Ultraviolet germicidal irradiation (UVGI)

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**3. Personal Protection Controls**

Measures directed to individual HCWs either to prevent infection or to prevent TB disease if infected.

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**Personal Protection Controls - Examples**

- Use of respirators to prevent infection during exposure to patients/residents with suspected or confirmed respiratory TB disease
- Detection and treatment of LTBI

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# Part Three: Key Concepts


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## Key Concept #1

Risk of health care associated transmission of TB bacteria varies with:

- Type of setting
- Occupational group
- Patient/resident population
- Effectiveness of TB prevention and control measures


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## How Are Health Care Settings' TB Risk Classifications Determined?



Table 2. Risk classification for health care settings

**NEW!**

| Risk category      | Facility size   | Number of active TB cases present annually |
|--------------------|---|--|
| Low                | Hospitals: ≥200 beds  | <6   |
|                    | Hospitals: <200 beds  | <3   |
|                    | Long-term care institutions including homes for the aged, nursing homes, chronic care facilities, hospices, retirement homes, designated assisted living centres and any other collective living centre | <3   |
| Not considered low | Hospitals: ≥200 beds  | ≥6   |
|                    | Hospitals: <200 beds  | ≥3   |
|                    | Long-term care institutions (as listed above)   | ≥3   |
|                    | Infirmaries in correctional facilities*   | ≥3   |

\*Correctional facilities that have never reported active TB cases can be considered low risk.

Source: Canadian Tuberculosis Standards, 7<sup>th</sup> Edition (2013)


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**How Does Occupational Group Influence TB Risk?**

Patient care activities are associated with varying degrees of exposure risk and subsequent infection with TB bacteria.

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**What Activities are Considered “High-Risk”?**

Per Cdn TB Standards 7<sup>th</sup> Edition (2013):

- Cough-inducing procedures (e.g., sputum induction)
- Autopsy
- Anatomy and pathology examinations
- Bronchoscopy
- Mycobacteriology laboratory procedures (e.g., handling *M. tuberculosis* cultures)

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**What Activities are Considered “Intermediate -Risk”?**

Per Cdn TB Standards 7<sup>th</sup> Edition (2013):

- Work requiring regular direct patient contact on units where patients with respiratory TB disease might be present (e.g., ER)
- Work in pediatric units where patients with TB might be admitted (r/t potential contact with parents/caregivers with undiagnosed respiratory TB disease)
- Cleaning of rooms of patients with respiratory TB disease

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**What Activities are Considered “Low-Risk”?**

Per Cdn TB Standards 7<sup>th</sup> Edition (2013):

- Work requiring minimal patient contact (e.g., clerical, reception, administration)
- Work on units where patients with respiratory TB disease are unlikely to be present

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**How Does Patient/Resident Population Influence TB Risk?**

A review of the community profile of TB disease can be helpful for informing TB risk assessments.

Some “at-risk” groups have been identified in the Canadian TB Standards (2013).

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**Which Groups Should be Considered “At-Risk” for TB Disease?**

Per Cdn TB Standards 7<sup>th</sup> Edition (2013):

- Those with a history of TB disease
- Staff/residents of homeless shelters
- The urban poor
- Staff/ inmates of correctional facilities and the previously incarcerated
- Injection drug users
- Aboriginal Canadians residing in communities with high TB rates

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**Which Groups Should be Considered “At-Risk” for TB Disease? (con’t)**

Per Cdn TB Standards 7<sup>th</sup> Edition (2013):

- People infected with HIV
- Elderly Canadian-born people (born before 1955)
- Those born or previously residing in countries with high TB incidence in Asia, Eastern Europe, Africa, and Latin America
- HCWs serving at-risk groups

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**What Influences the Effectiveness of TB Infection Prevention and Control?**

The most important element of any TB management program is rapid diagnosis, isolation and start of therapy for patients/residents with respiratory TB disease.

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**Did You Know?**

Delayed diagnosis occurs in **almost half** of all hospitalized patients in whom respiratory TB disease is subsequently detected.

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## Part 4:

### Key Practices

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#### Key Practice

Concomitant respiratory TB disease should be ruled out in cases of non-respiratory TB.



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#### Key Practice

A cough of more than 3 weeks' duration with or without weight loss and fever in a person belonging to one of the at-risk groups should prompt a thorough investigation to determine whether active respiratory TB disease is the cause.

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**Key Practice (AIIR AVAILABLE)**

Patients (including children of any age) who show signs and symptoms of TB, or whose respiratory secretions (e.g., sputum) yield AFB or whose chest radiographs indicate active TB disease should be immediately isolated in an AIIR.


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**Key Practice (AIIR NOT AVAILABLE)**

In the absence of an AIIR, the patient should be placed into a single room (with the door closed and a portable air filtration unit used if available) until transfer to a facility where an AIIR is available. Airborne precautions also include the use of respirators by HCWs caring for patients with suspected or confirmed active TB disease.


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**Key Practice**

Masks should be used by patients/residents with suspected or confirmed respiratory TB disease when outside an AIIR.


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### Surgical/Procedure Masks

- Physical barrier
- Worn by patients to trap droplets they expel (reduces concentration of droplet nuclei)
- To be worn whenever leaving AIIR and/or during transport to AIIR or other locations
- NOT EFFECTIVE to protect HCW from inhaling *M. tuberculosis* as less than 50% effective for filtering small droplet nuclei (1 to 5 microns)



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### Respiratory Etiquette for TB Patients

- Cover coughs with a tissue, even while in AIIR, to reduce concentration of droplet nuclei
- Use a surgical/procedure mask when outside of the AIIR

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### Respirators

- Prevent inhalation of aerosols containing infectious microorganisms
- Mostly widely-used are N95 filter class (N95 respirators)
- Certified to filter 95% of particles of diameter 0.3 microns or larger with less than 10% leak
- Should be used by HCWs providing care to or transporting patients with suspected or confirmed respiratory TB disease

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### Fit Testing and Seal Checking

- **Fit testing** is used to determine whether a particular size and model of respirator fits appropriately
- HCWs should refer to jurisdictional requirements for fit testing processes and frequency
- **Seal checking** is done each time a respirator is put on to ensure a proper seal to the face (use manufacturer's instructions)

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### Key Practice

During transport to and from an AIIR, patients/residents with suspected/confirmed respiratory TB disease should wear a **mask**, and HCWs involved in the transport should wear a **respirator**.

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**Key Practice**

Once airborne isolation precautions are initiated, the patient/resident should remain in the AIIR until isolation is discontinued by designated medical personnel.\*

\*See CTS 7 for detailed recommendations on discontinuing isolation


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**Key Practice**

Criteria for discontinuation of airborne precautions include:

- Establishment of an alternative diagnosis
- Clinical improvement
- Adherence to effective therapy
- Sputum smear and/or culture conversion
- Drug-susceptibility tests that indicate fully sensitive organisms or low clinical suspicion of drug resistance


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**Did You Know?**

Patients with suspected or confirmed respiratory TB disease **should not** share rooms with each other, as their strains and levels of infectivity could be different.


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## Part 5:

# Supporting Patients on Home Isolation

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### Establish Clear Guidelines

- **NO** non-essential visitors - HCWs should be only visitors to the home
- **NO** non-essential travel - travel allowed only to medical appointments
- **NO** use of public transportation
- Outdoor ambulation usually allowed if not in close contact with susceptible people for long periods

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### Anticipate Needs and Challenges

- Identify personal and service needs, including a supply of surgical masks to wear during visits from HCWs (e.g., for DOT)
- Discuss activities that can be done safely
- Use incentives and enablers to support adherence and compliance

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### Visiting Patients on Home Isolation

- Wear an N-95 respirator throughout visit
- Have patient wear a surgical mask if possible (bring a supply with you)
- Ask patient to cover coughs and sneezes during visit
- Increase ventilation as much as possible (e.g., open windows, doors)



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### Safe Collection of Sputum Specimens from Patients on Home Isolation

- Have patient collect specimens in advance or after HCW visit if possible
- If an on-the-spot specimen is required, HCWs should wear a respirator and separate themselves from area where specimen is being produced
- Producing/collecting specimens outside can reduce indoor concentrations of droplet nuclei



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## Part 6: Frequently Asked Questions (FAQs)



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