

Theme: Travelers Medicines and In-Flight Healthcare.

Prevention of Airborne and Droplet Infection: What do I do?

LiveWell Initiative : Grand Health Bazaar 2013
Havilah Centre
April 19

Professor Folasade Ogunsola
College of Medicine, University of Lagos

Introduction

- ▶ Over 1 billion passengers travel by air annually;
- ▶ 50 million of these travel to the developing world.
- ▶ People are together in a confined environment
- ▶ Potential risk of infection
 - All types can occur
 - especially large droplet and airborne
 - Infrequently reported and very difficult to assess

Organisms transmitted through respiratory tract

► Droplet:

- Pertussis (whooping cough)
- Meningococcus meningitis;
- Seasonal, pandemic, and Avian influenza
- Adenovirus
- SARS

► Airborne:

- Pulmonary TB;
- measles;
- varicella (chicken pox)

- ▶ What if a person with Tuberculosis or SARS or Flu enters the plane?



TB BURDEN

- ▶ One person infected **every second**
- ▶ Worldwide: More than 9 million new cases every year
- ▶ More than 4 million new AFB smear-positive cases every year
- ▶ Nigeria ranks 10th among the 22 high-burden TB countries in the world.
 - An estimated 320,000 prevalent cases of TB in 2010, equivalent to 199/100,000 cases.

Factors affecting TB infection

- ▶ Number of organisms expelled into the air
- ▶ Concentration of organisms (volume of air space and ventilation)
- ▶ Duration of exposure
- ▶ Proximity to source
- ▶ Immune status of exposed person

What happens when a Person Coughs?



➤ Coughing

➤ Talking

➤ Sneezing

➤ Singing

Number and size of organisms expelled

- ▶ Number of organisms expelled during:

Talking	0–200
Coughing	0–3,500
Sneezing	4,500–1,000,000
- ▶ Spread of droplets affected by air velocity or force:

Sneeze	50 to 300 meters/second
	~75% of droplets are 10 microns

Is there a risk for TB (and other respiratory) infections in a plane?

YES

How big is the Risk?

	Number of reports	Comments
Airborne/fomites		
TB ^{19, 20, 21-23}	2	Positive TB skin test only. No active TB.
SARS ^{21, 24-25}	4	No cases since WHO guidelines.
Common cold ²⁶	0	Difficult to investigate.
Influenza ^{10, 27, 28}	2	None since ventilation regulations.
Meningococcal disease ²⁹	0	21 reports of ill passengers, no secondary cases
Measles ^{12, 43}	3	Imported cases and international adoptions

On average the risk of disease transmission is associated with sitting within two rows of a contagious passenger for a flight time of more than 8 h.

Diagram of SARS outbreak aboard an airline

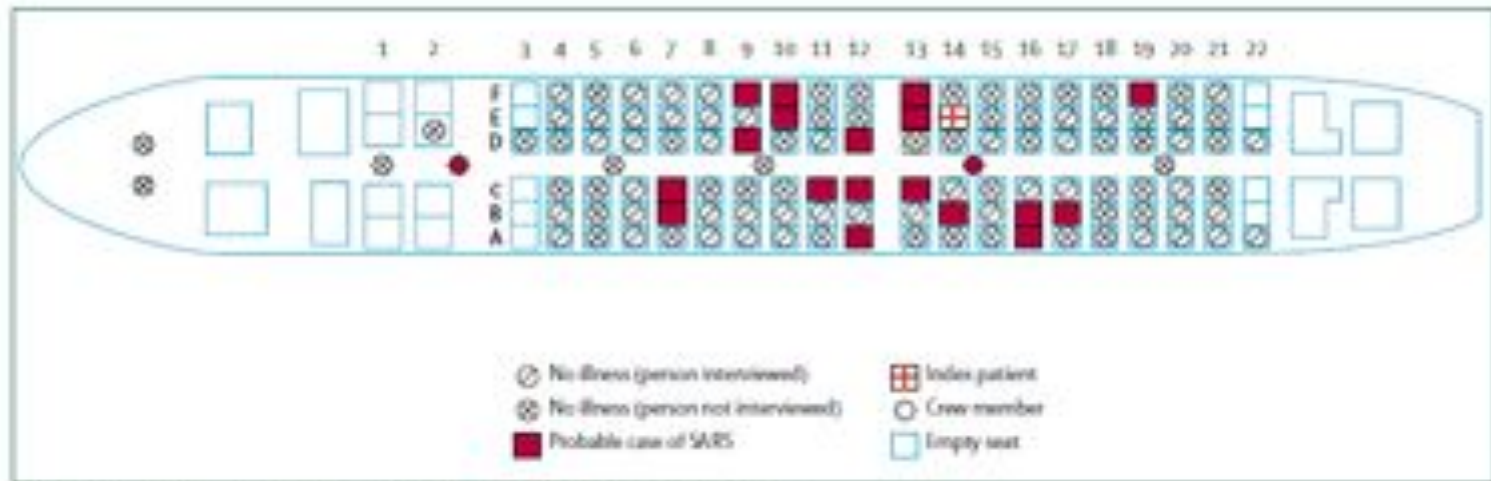


Figure 2: Schematic diagram of SARS outbreak aboard Hong Kong to Beijing flight
From reference 31 with permission of the publisher.

- A 3-hour flight carrying 120 passengers travelling from Hong Kong to Beijing on March 15, 2003
- 22 people contracted SARS

Airflow in Cabin

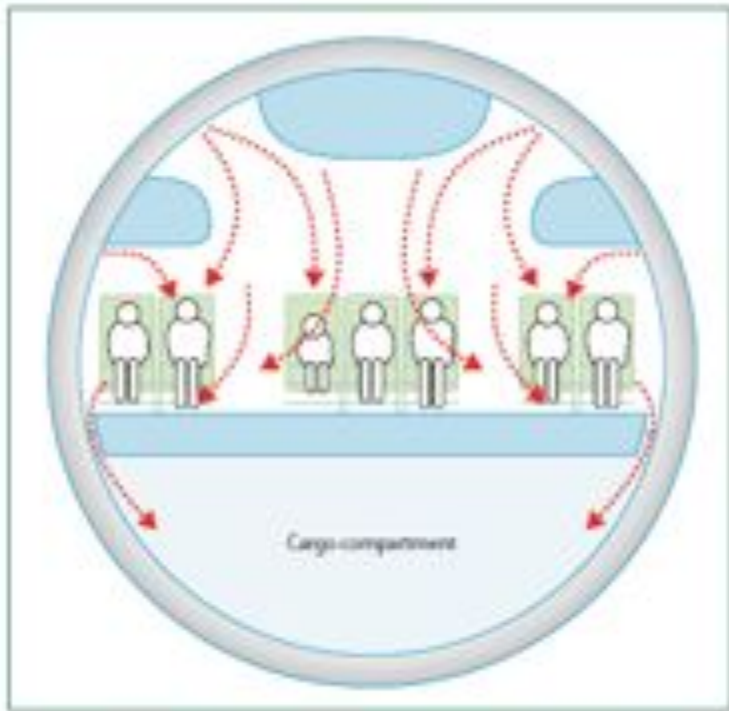
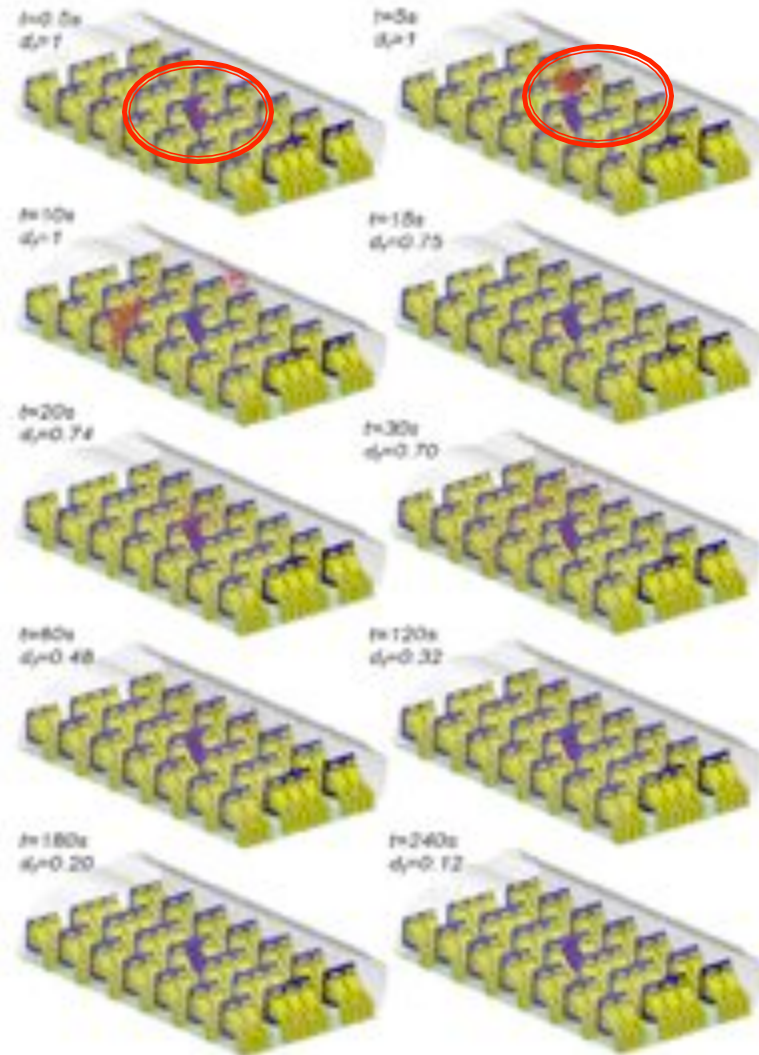


Figure 1: Air circulation pattern in typical airline passenger cabin
From WHO* with permission of the publisher. Arrows show air currents.

- ▶ Air circulation patterns
- ▶ side-to-side (laminar) – enters from overhead circulates and exits near the floor
- ▶ Very Little front-to back longitudinal) airflow
- ▶ Air circulation pattern divides air flow into sections within the cabin, thereby limiting the spread of airborne particles
- ▶ 50% of air is recirculated
 - HEPA filters
 - Remove 99% of bacteria

What happens in a cabin when we cough?



- ▶ Study:
- ▶ Traced the droplets exhaled from a single cough,
- ▶ Findings
- ▶ Bulk **airflow pattern** in the cabin played the **most important role on the droplet transport**.
- ▶ The droplets were contained in **the row before, at, and after the index patient within 30 s**
- ▶ Then dispersed uniformly to all the seven rows in 4 minutes
- ▶ **BUT** within one minute total airborne droplet fraction reduced to 48%,
- ▶ By 4mins only 12% of the total droplet fraction was still airborne

Distribution of a single cough



Should we be afraid to fly?



NO?

- ▶ Risk is not higher than in any other place where people congregate
- ▶ It may be less risky
 - Air exchange is high (15–20 Vs 6–12 air changes/hr in most offices)
 - Air is passed through HEPA filters
 - Trap 99.7% of bacteria and viruses
- ▶ Those close to the person coughing are most at risk
 - Directly in front and to side
- ▶ Risk reduced to **almost zero** in passengers seated 15 seats from the infectious source
- ▶ **Ventilation provides a crucial determinant of risk, and efforts to increase ventilation will reduce risk....**
- ▶ Airlines do not allow KNOWN open TB cases or those with infectious diseases on board

What is my role?



We have a duty to ensure we don't infect others



COVER YOUR COUGH

Stop the spread of germs!



Use tissue to cover your mouth and nose when you cough or sneeze

Throw your tissue in the waste basket



or cover your cough or sneeze with your upper sleeve, not your hands



Clean Your Hands



After coughing or sneezing wash for 20 seconds with soap and warm water or clean with hand sanitizer



- ▶ Number of organisms expelled into the air
- ▶ Concentration of organisms (volume of air space and ventilation)
- ▶ Duration of exposure
- ▶ Proximity to source
- ▶ Immune status of exposed person

- ▶ Don't fly if you have the Flu, TB, Measles, SARS, Chickenpox.....

Thank You
For Listening!