COVID-19 Routes of Transmission & Implications for Worker Protection

Lisa M Brosseau, ScD, CIH

Professor

(retired, University of Illinois at Chicago)

AEROSOL GENERATION

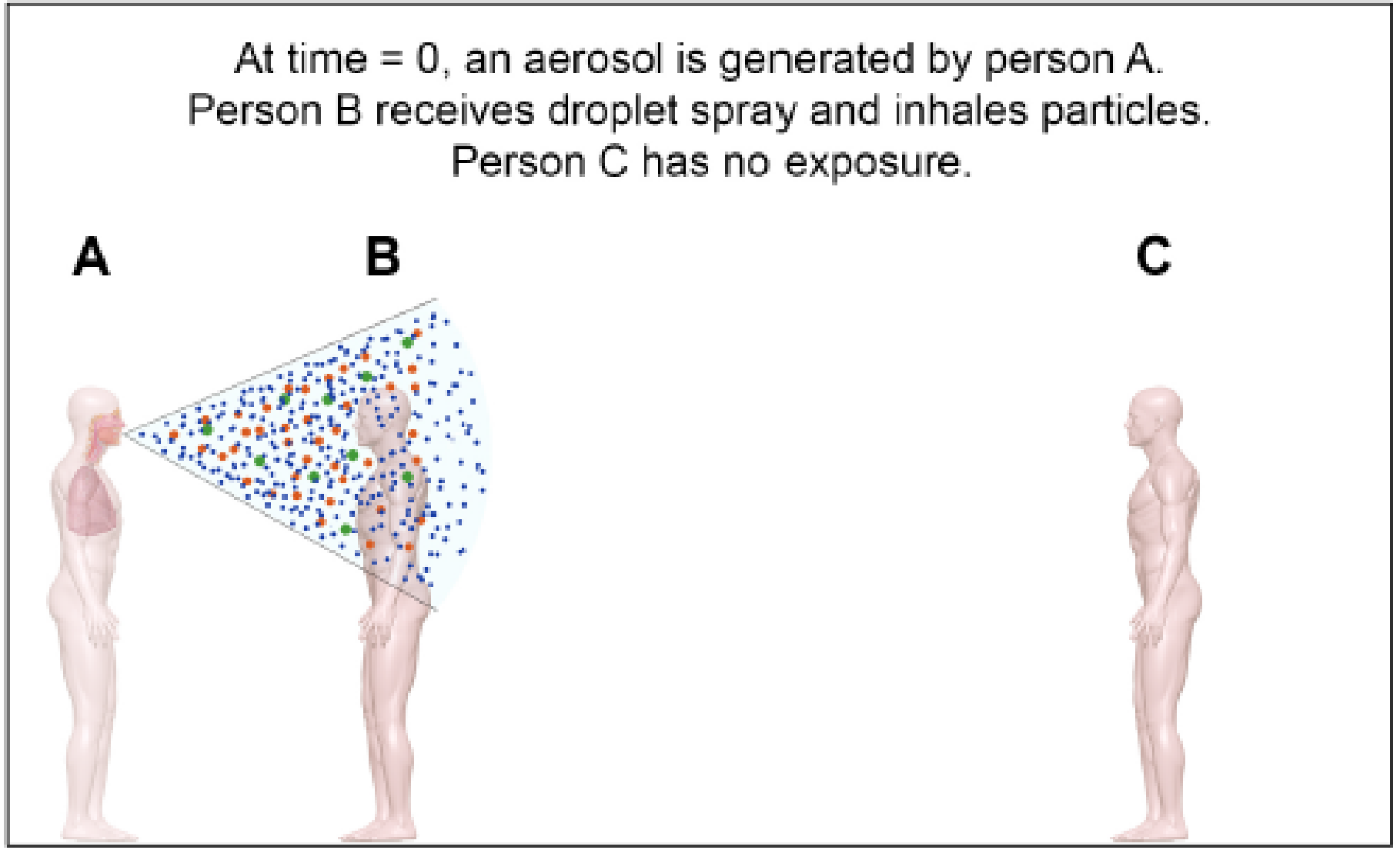
Aerosols can be generated by natural processes:

- Vomit
- Hemorrhage
- Diarrhea (toilet flushing)
- Coughing
- Sneezing
- Talking

Aerosols can be generated by medical procedures:

- Intubation
- Bronchoscopy
- Drug delivery
- Respiratory support

Inhalation can occur at the time and near the point of generation



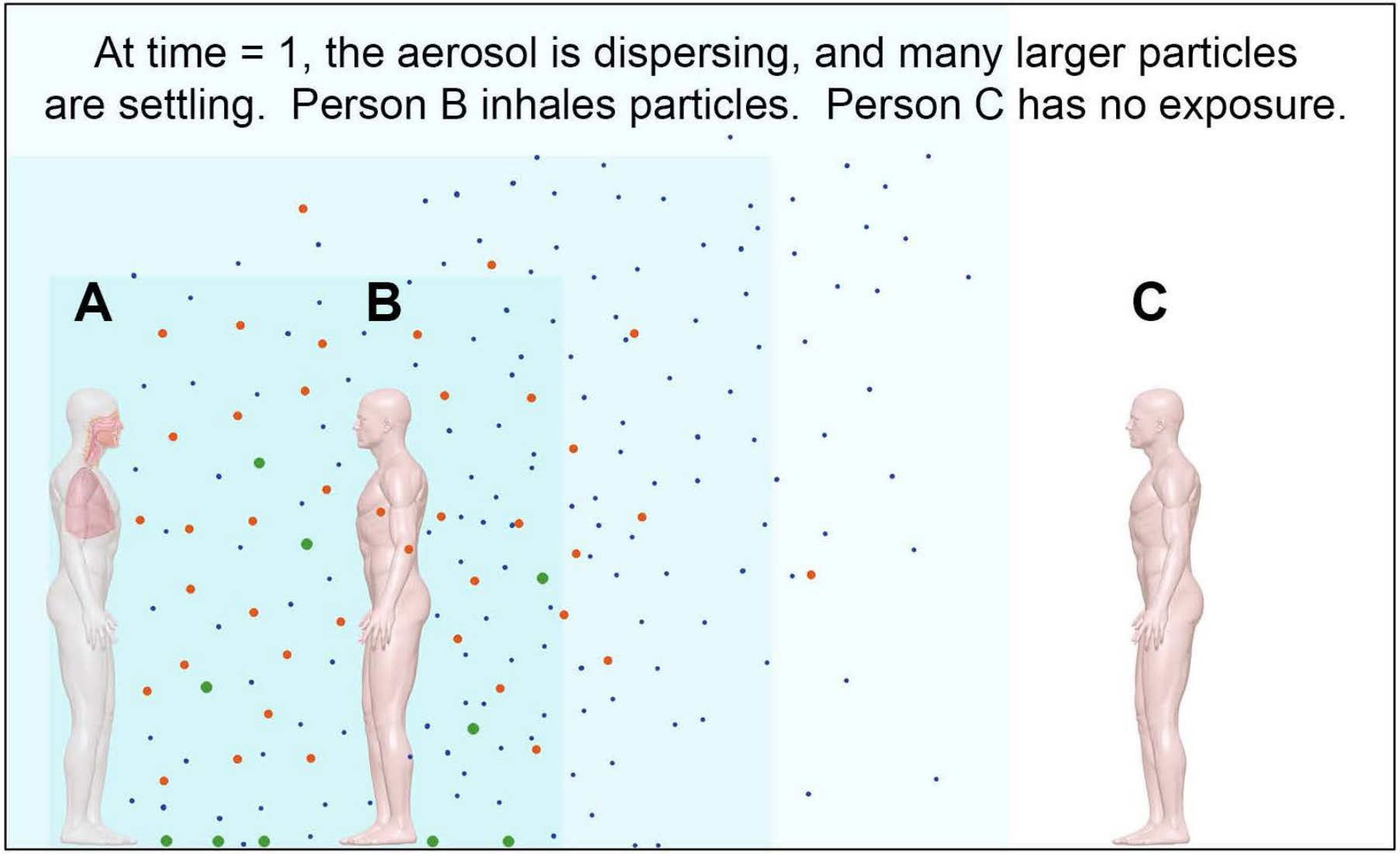
AEROSOL SETTLING AND DIFFUSION

Inhalation is possible near and further from the point of generation

Inhalation continues to be possible near the source as settling and diffusion take place.

Aerosol transmission (inhalation) is possible further from the source over time.

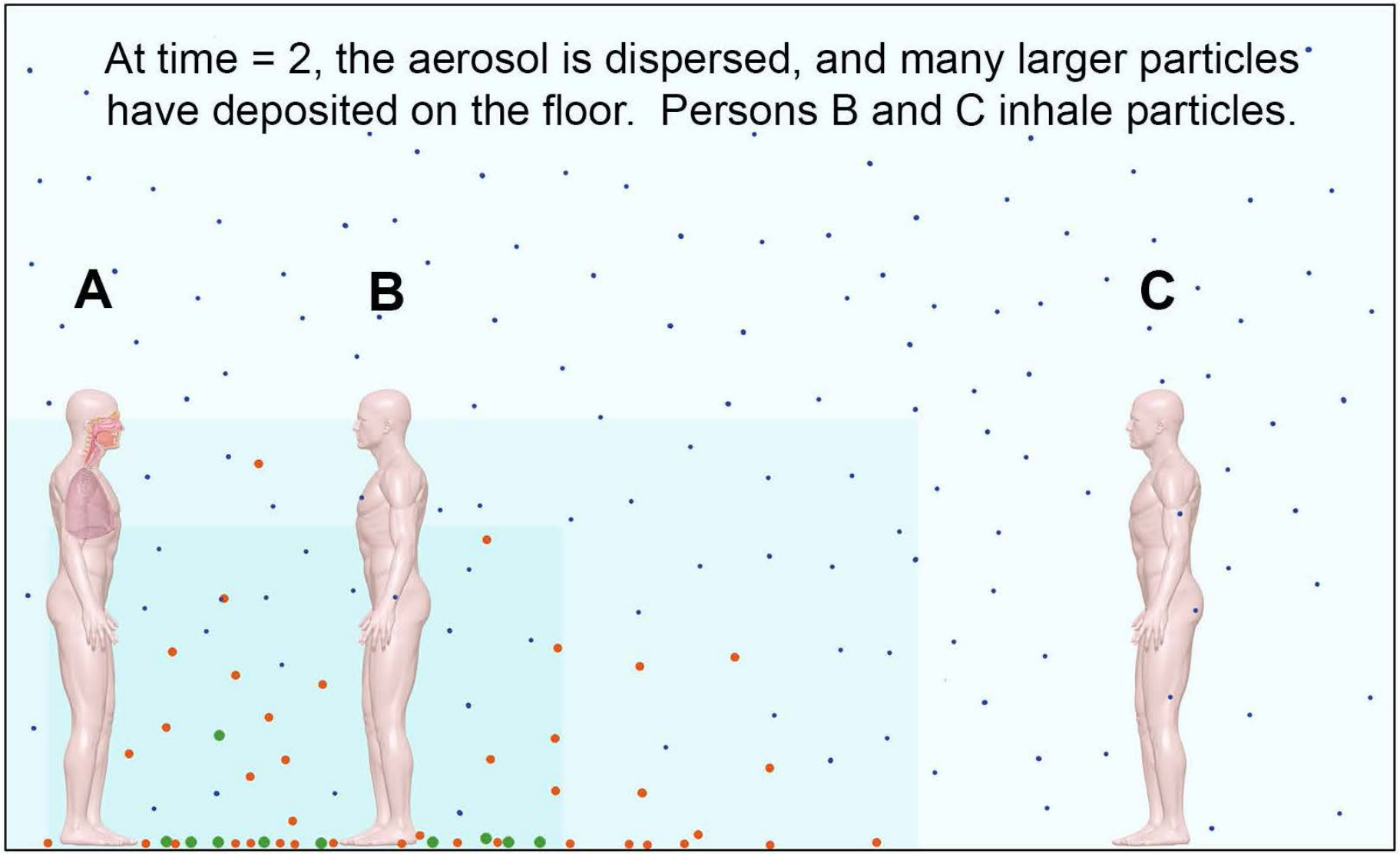
Infection depends on organism viability and dose (concentration of organisms in aerosol).



AEROSOL DIFFUSION AND SETTLING

Aerosol transmission (inhalation) is possible throughout the space

Infection depends on organism viability and dose (concentration of organisms in aerosol).



Aerosol Transmission

Establish biological plausibility*

- Aerosols are generated at a source
- Organism remains viable in air at environmental conditions along a path
- Receptors are accessible following inhalation or impaction

Jones RM and Brosseau LM. "Aerosol Transmission of Infectious Disease." *Journal of Occupational and Environmental Medicine* 57.5 (2015): 501-508.

	Risk Group			
Weight of Evidence	1	2	3	4
9				
8		**Influenza**	**Tuberculosis**	
7		**Norovirus**	**SARS**	**Ebola**
6				
5				
4				
3				

COVID-19

Level of concern

Overall weight of evidence = 7 – 8 for COVID-19
Risk group = 3 (like SARS)
High level of concern for aerosol transmission
Explains rapid transmission from one person to the next

Masks and Respirators for COVID-19 Aerosols

Healthcare Workers Have Highest Risk

- Masks as source control on patients
- Airborne infection isolation rooms for suspected cases
- N95 filtering facepiece respirators for healthcare workers
- Respirators with higher levels of protection for patients with severe symptoms and aerosol-generating procedures

Workers with High Risk Not in Healthcare

- Implement as many source and path controls as possible before using PPE

Workers with Moderate or Low Risk

- Source and path controls
- No PPE

Public

- Stay home!
- No masks or respirators

All Disease Transmission Routes are Possible for COVID-19

Contact	Transfer from infectious source or object to mucous membranes
Droplet	Large droplets “propelled” onto face and mucous membranes (no inhalation)
Airborne	Droplet nuclei inhaled ONLY when susceptible person is far from infectious source
Aerosol	Aerosols inhaled near the source

Protecting Healthcare Workers

Have healthcare and public health organizations implemented all possible engineering and administrative controls?

CDC checklist

What about elastomeric respirators?

Donations from companies

Give every healthcare worker their own respirator

Ask H&S professionals to assist with fit testing

Asking the public to wear surgical masks won't stop transmission

What year is this?

1918?

Cloth masks do NOT work!