



Diphtheria – My Phtheories on Diphtheria

Date May 16, 2024: Erica Susky, MSc CIC

IPAC Central South Ontario Education
Day

Agenda

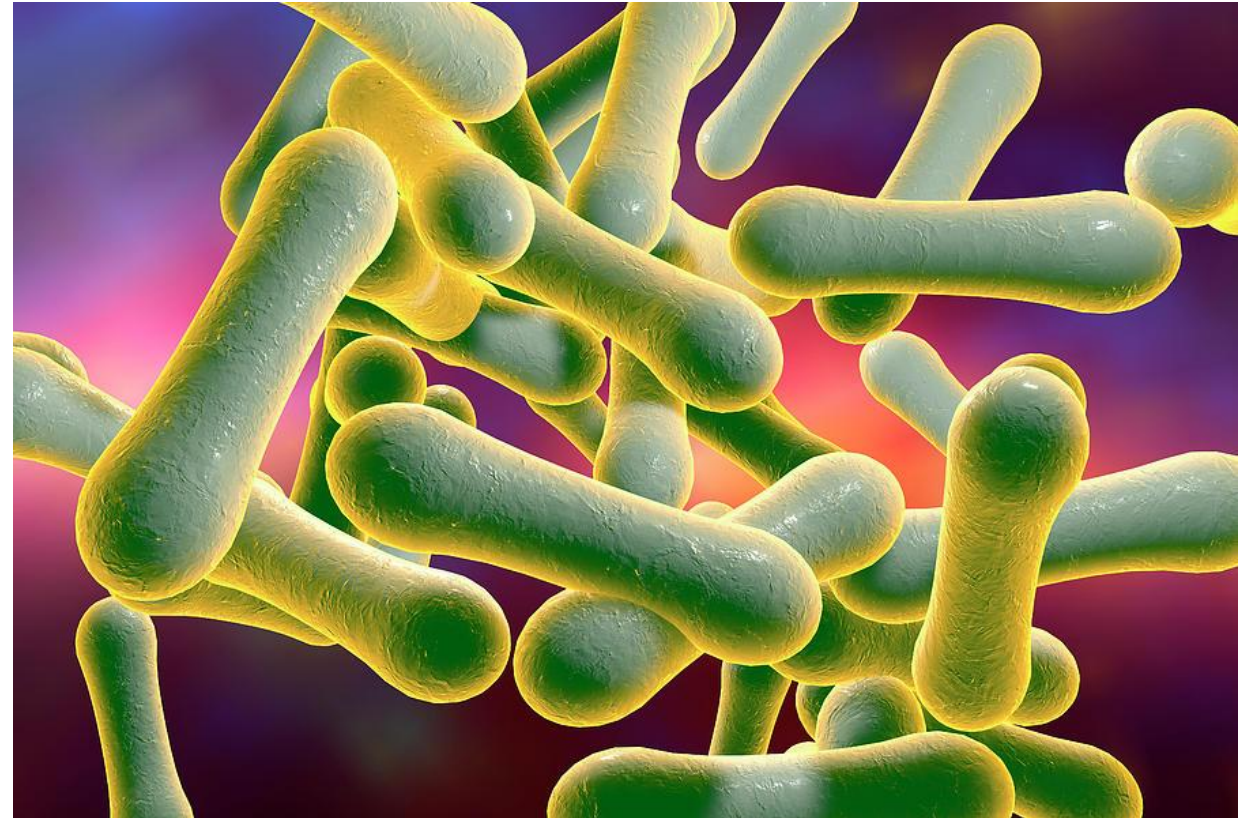
- The bacterium – *Corynebacterium diphtheriae*.
- The disease - Diphtheria.
- The country - Canada.
- The spread – Transmission and outbreaks.
- The cases – Real examples and management.
- The solution – Conclusions.

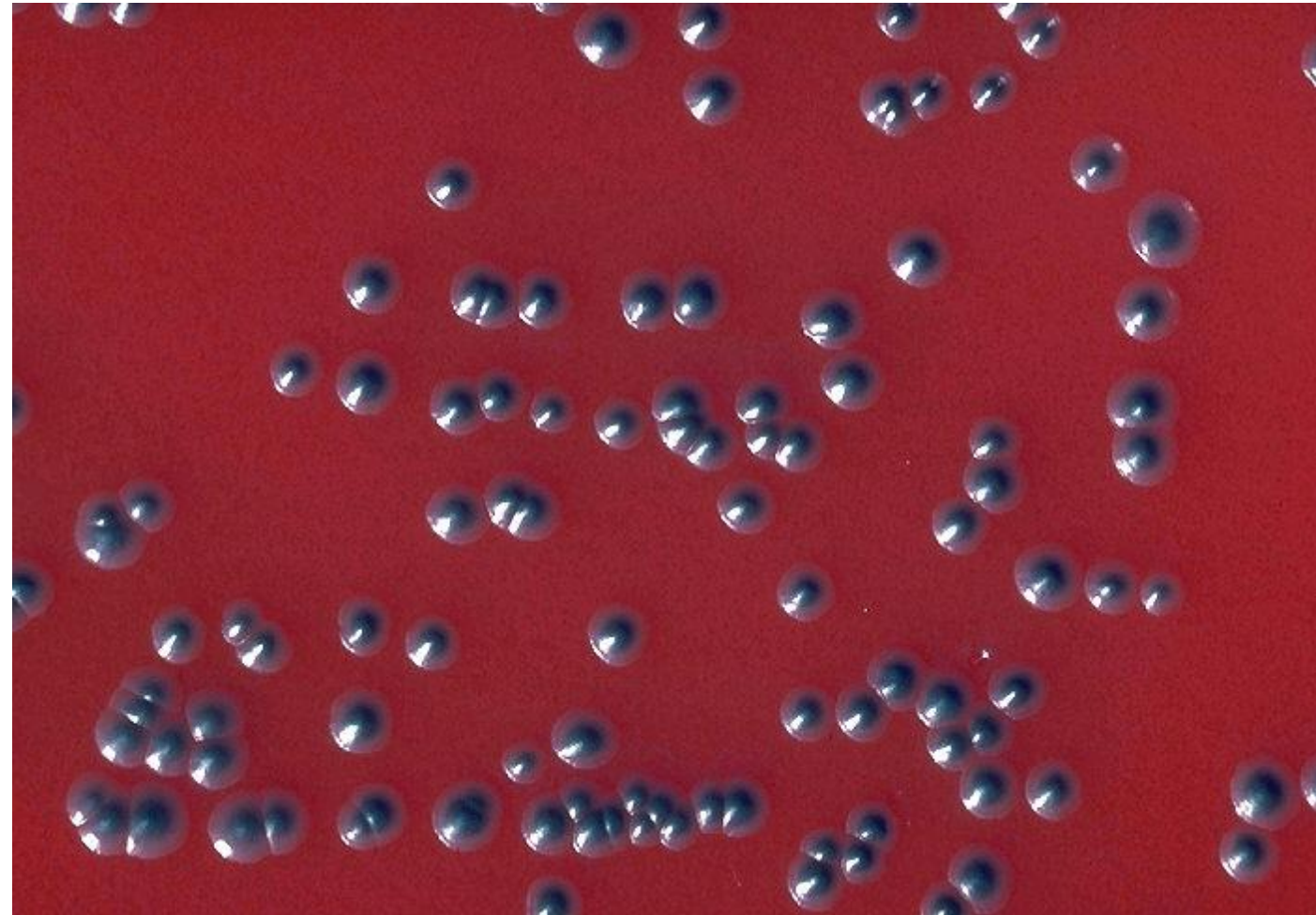
Corynebacterium diphtheriae -

The bacterium

Corynebacterium diphtheriae

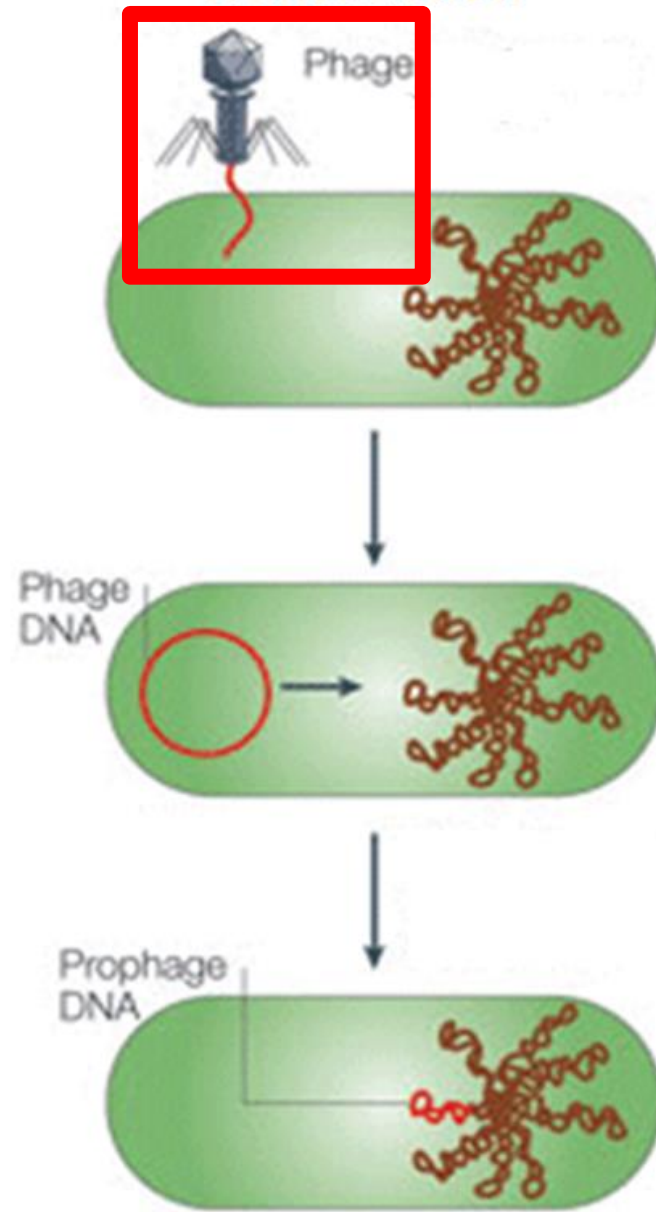
- Fastidious.
- Toxigenic (exotoxin).
- Non-toxigenic.
- Can be part of microbiome.





(www.microbeonline.com/corynebacterium-diphtheriae-properties-pathogenesis-diagnosis/)

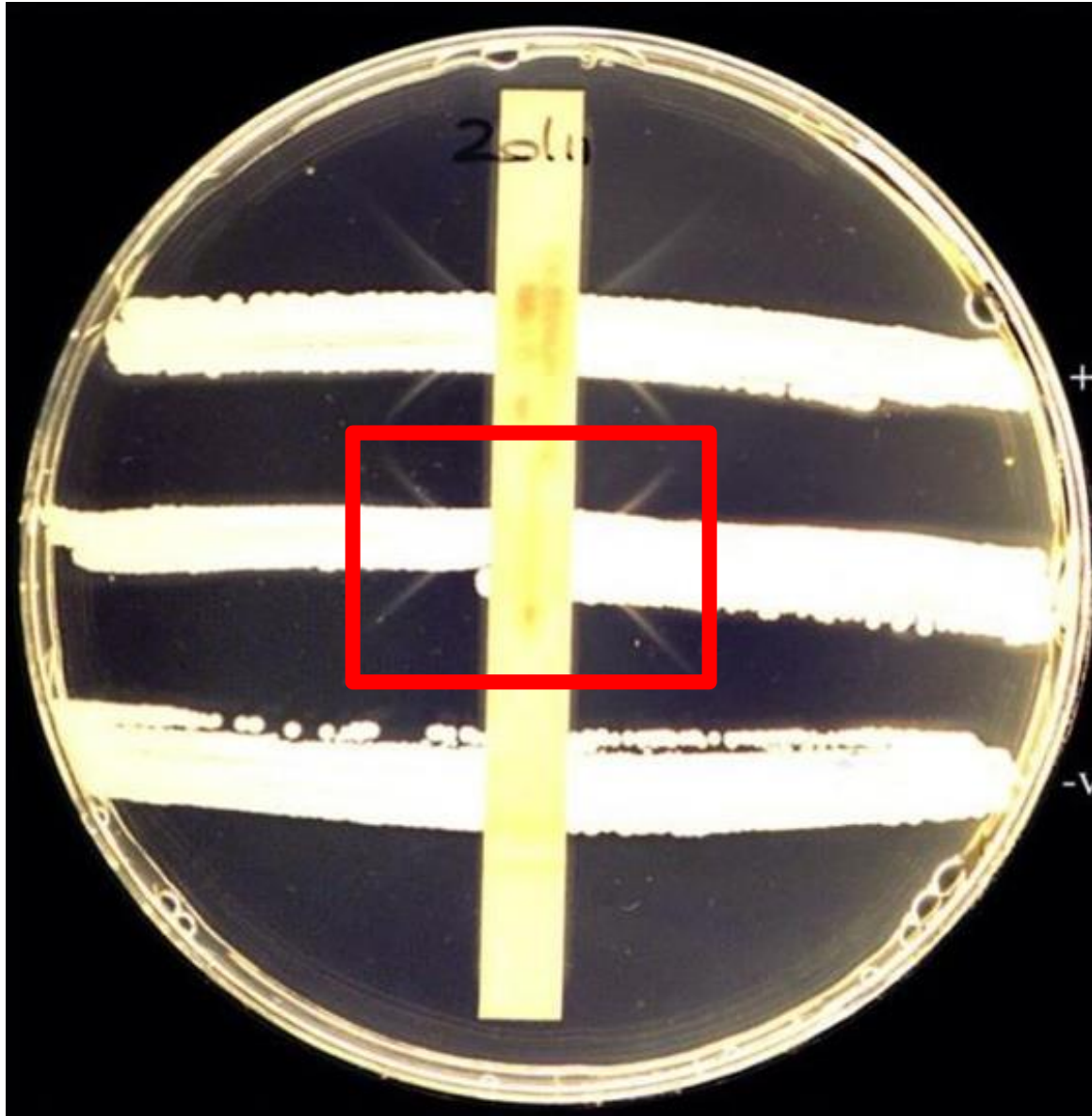
Transduction



Types of *C. diphtheriae*

- Non-toxigenic: Generally less severe.
- Non-toxigenic tox-bearing: Toxin gene but not active.
- Toxigenic: Respiratory diphtheria. Vaccine is effective.

The Elek Toxin Detection Test



+ Positive Control

Test Isolate

- Negative Control

Diphtheria – The disease

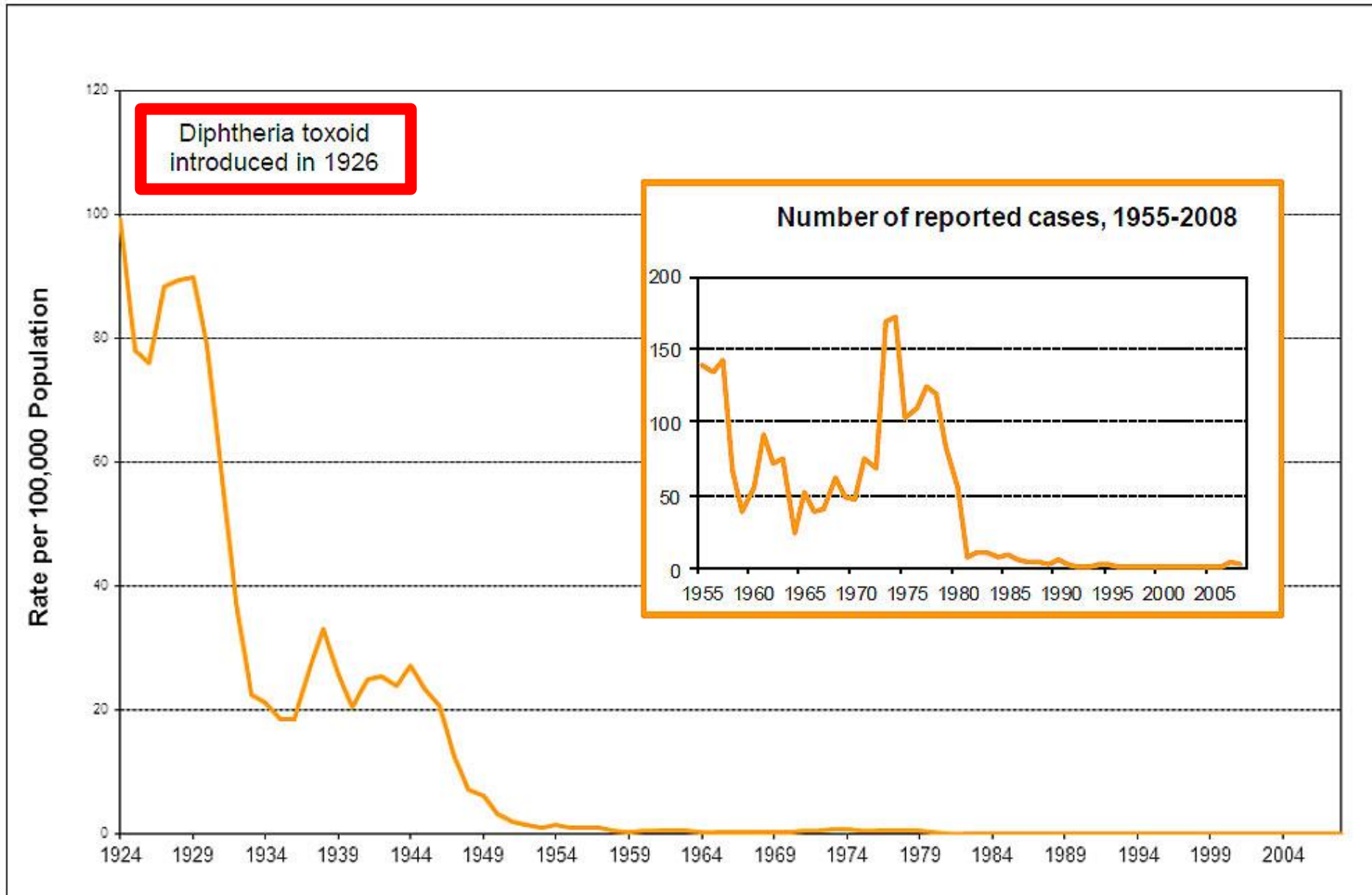
Types of Diphtheria

- Respiratory (sore throat, fever, swollen neck).
- Cutaneous (skin/wound).
- Non-toxigenic cutaneous forms, re-emerging/linked with outbreaks.
- Homeless, alcohol/injected drugs abuse, diabetes mellitus.
- Risk in partially/non-vaccinated travelers.

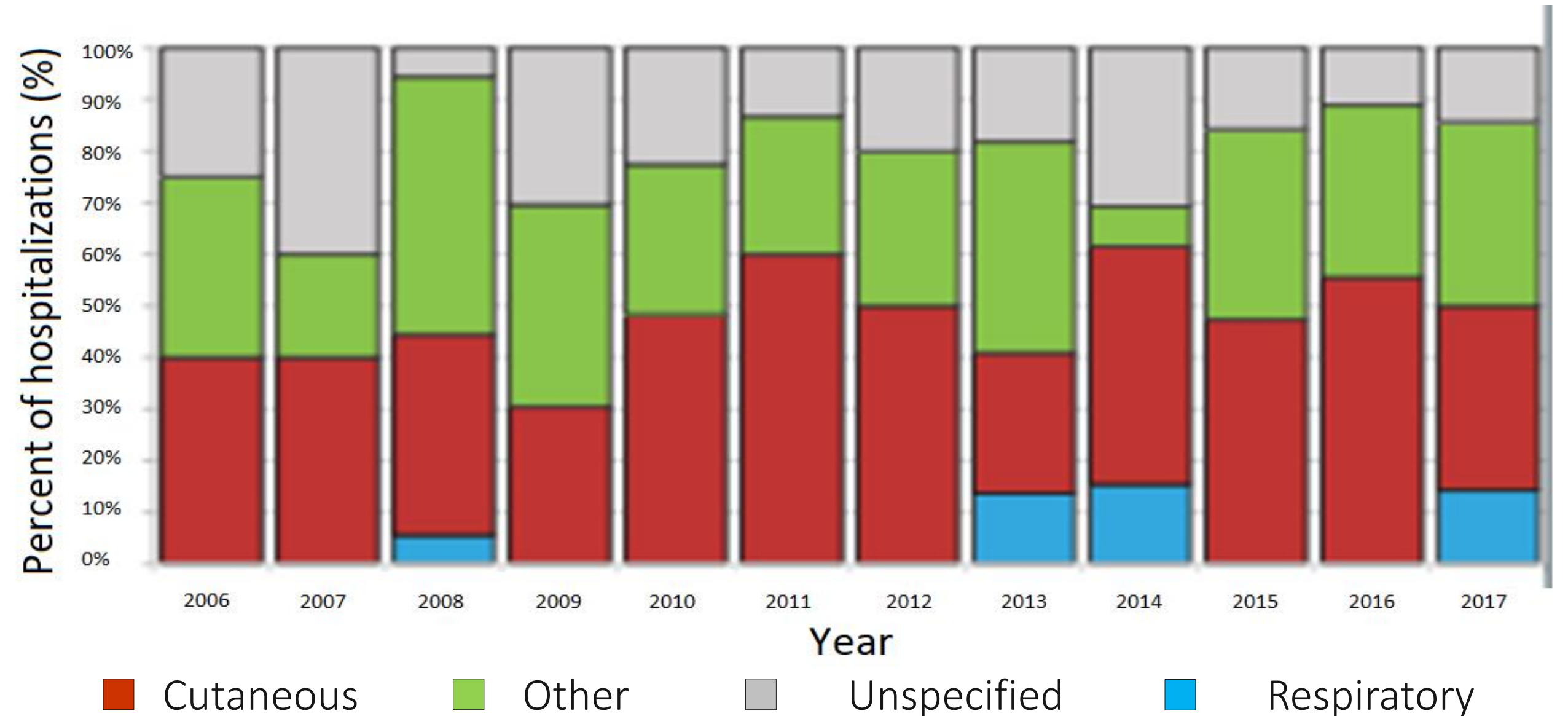


Diphtheria in Canada - The country

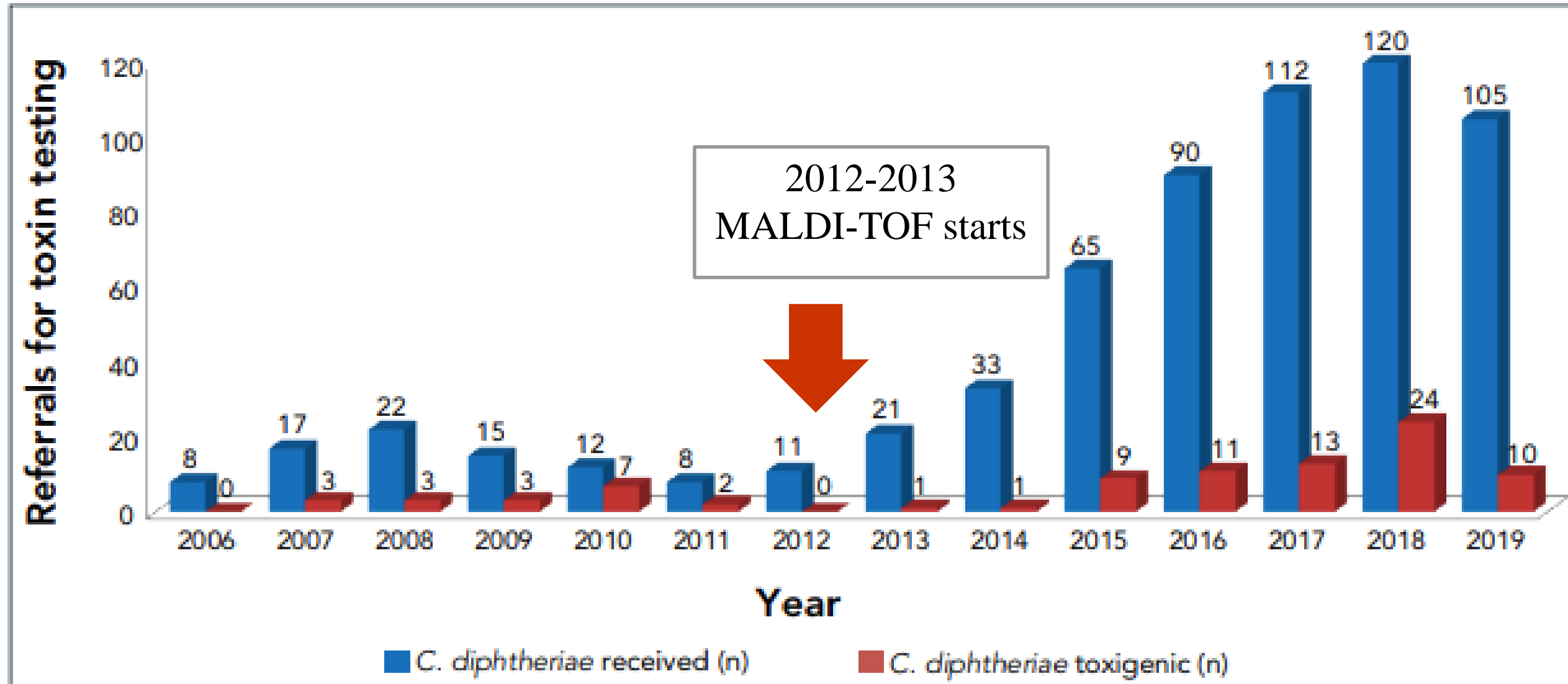
Incidence of Diphtheria, Canada, 1924-2008



Hospitalizations by Site of Infection, 2006 - 2017



Toxigenic *C. diphtheriae*, January 2006 to July 2019



Summary of Data

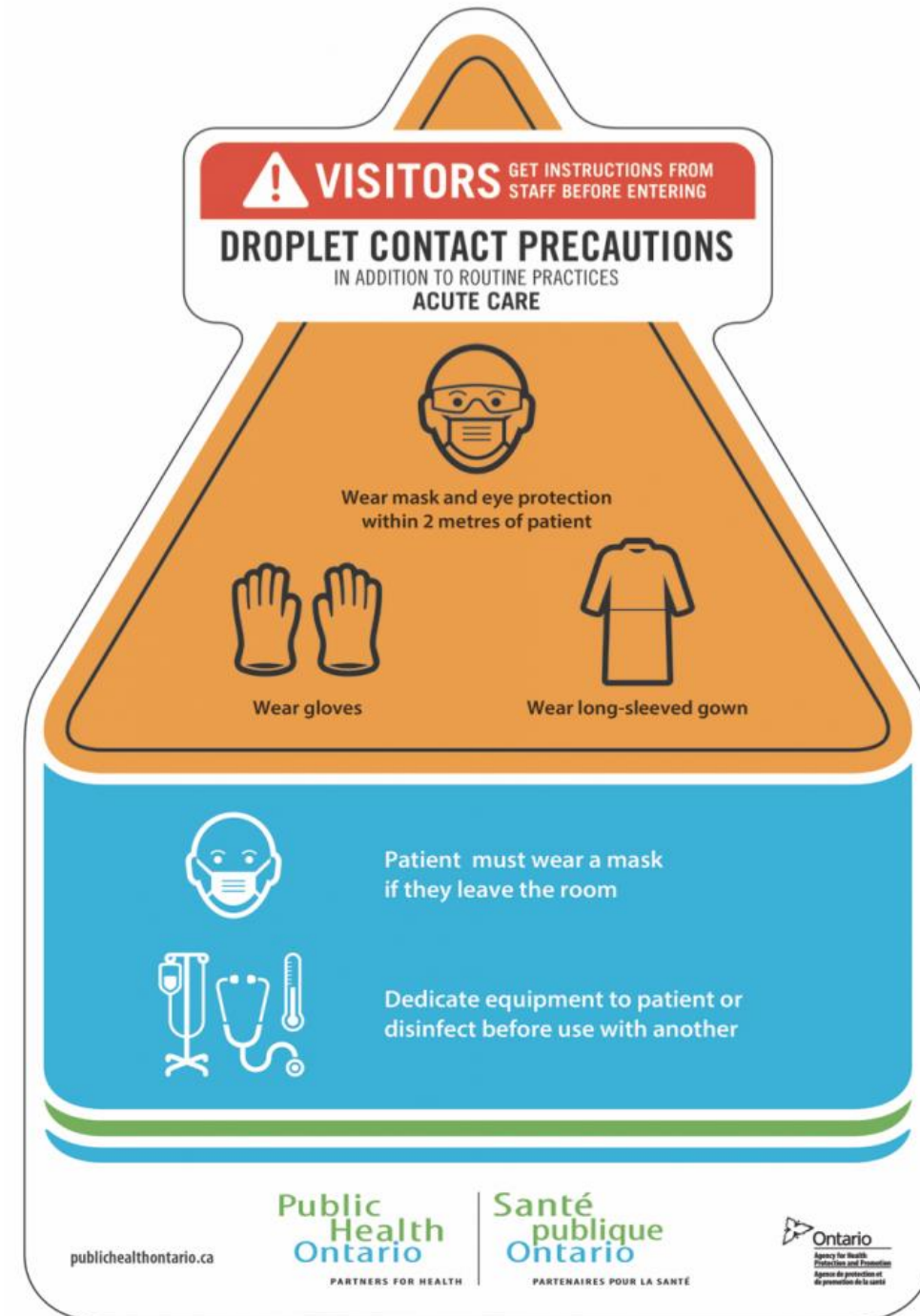
- Diphtheria is rare in Canada.
- Classified by:
 - Toxigenic/Non-toxigenic.
 - Respiratory/Cutaneous.
- Increase of non-toxigenic cases:
 - MALDI-TOF.
 - Burden of cutaneous cases increasing.

Transmission and Outbreaks – The spread

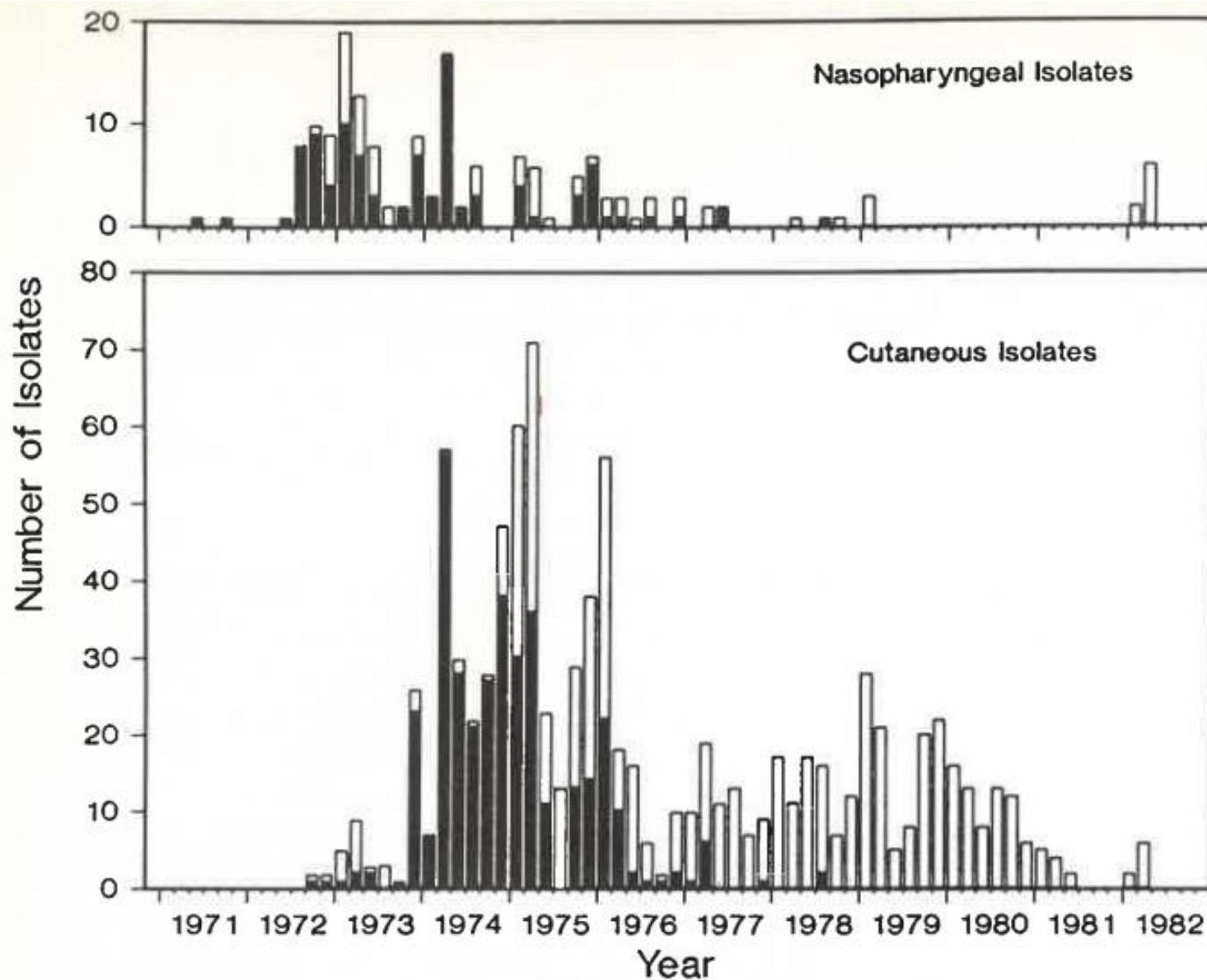


Mode of Transmission

- Respiratory: droplet precautions.
- Cutaneous: contact precautions.
- Culture nose, throat and lesions:
 - 24 hours after treatment ended.
 - 24 hours later another set.



Outbreak in Under Housed People, Seattle USA



(Harnisch et al. 1989)

Control Measures

- Immunization.
- Increased public health resources.
- Routine inpatient care of cases.
- Widespread testing for diphtheria.

Cutaneous Cases in Downtown Eastside, Vancouver (1998-2007)

Demographic Parameter	Number (%) of Patients (N=33)	
Gender	Male	20 (60.1)
	Female	13 (39.9)
Residence	Downtown Eastside	30 (90.9)
	Non-Downtown Eastside	3 (9.1)
Medical History	HIV	11 (33.3)
	Hepatitis B	6 (18.2)
	Hepatitis C	21 (63.4)
	Diabetes Mellitus	3 (9.1)
	Recurrent ulcers	8 (24.2)
Substance History	Alcohol (>14 drinks/week)	12 (36.4)
	Drug use	22 (66.7)

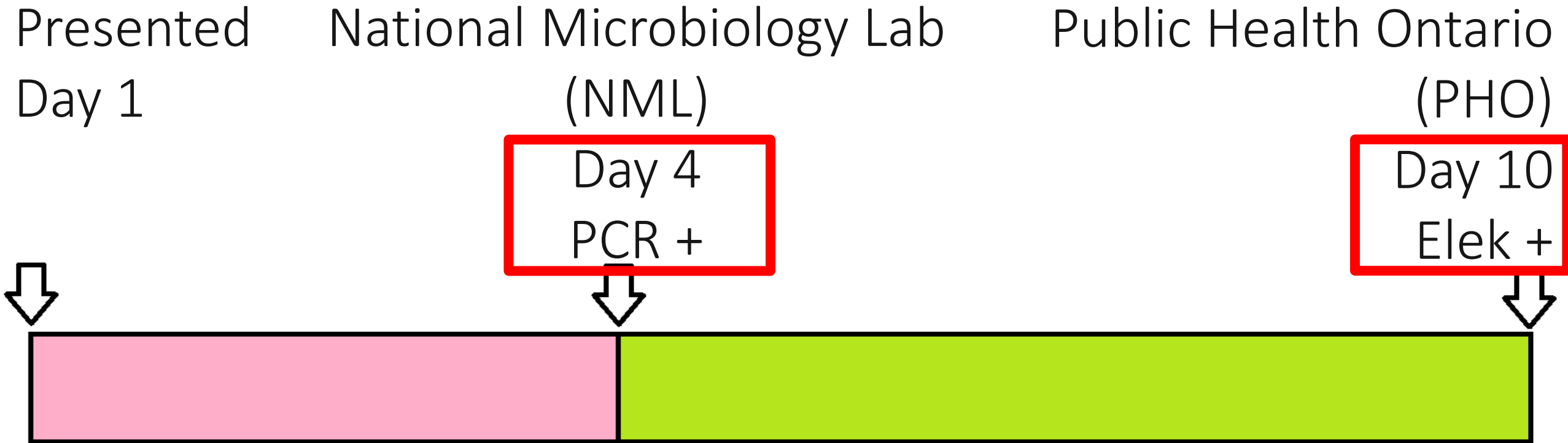
(Lowe et al. 2011)

Real Examples and Management – The cases

Case 1 – Respiratory Diphtheria

- Sore throat, dry cough, swollen neck.
- Shortness of breath, fever and pneumonia.
- All the usual cultures were negative.
- Endotracheal aspirate: Coryneform and Diphtheroid bacteria.

Case 1 – Timeline



C. diphtheriae incubation period = 10 days

(Cholewa et al. 2021)

Case 2 – Cutaneous Diphtheria

- 39 year old male from a shelter.
- October 8-13 admitted with ankle fracture.
- Had surgery.
- Returned October 23.
- Wound cultured *C. diphtheriae*.

Management

- Nasal/throat swabs negative (prior antibiotics).
- Contact and droplet precautions.
- Single room (no patient exposures).
- Unit terminal clean/wiping shared equipment.
- Elek toxin negative.

Staff Contacts (N=49)

10 days before
culture or
symptom
onset

Start
of antibiotics

48 hours
of antibiotics



Exposure period = 12 days

Follow Up for Confirmed Exposures

- Laboratory testing.
- Chemoprophylaxis.
- Vaccination.
- Exclusion from work.

Vaccination Program

- 2, 4, 6, 12-23 months of age.
- 4-6, and 14-16 years of age.
- Adults get boosters every 10 years.



Vaccination of Staff Interacting with Case 2

Last Vaccine Date	Staff Number (N=49)
Within 5 years	12
5-10 years	10
Over 10 years	10
Could not recall	17

Case 3 - Severe Case of Diphtheria

- Admitted Dec 18, 2023.
- History alcohol use, group home.
- Unknown vaccine history.
- Shortness of breath, pneumonia on imaging.
- Intubated.
- Influenza A positive.

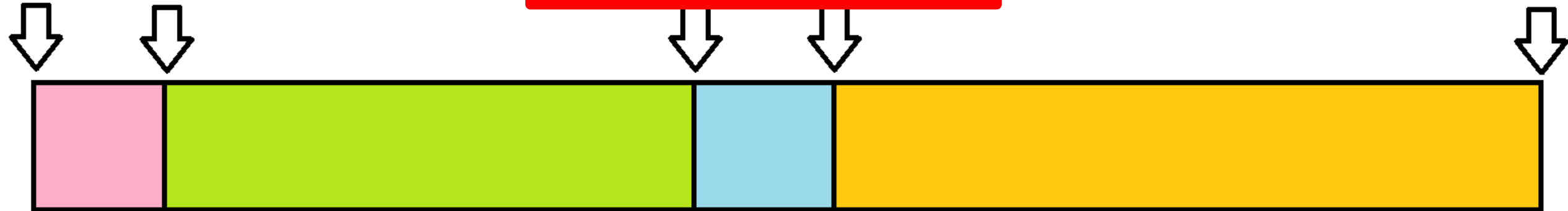
Case 3 - Timeline

Presented
Day 1

Death
Day 31

Culture +
Day 3

NML	PHO
PCR -	Elek -
Day 18	Day 21



Conclusions –

The solution

Conclusions

- Re-emerging, and associated with outbreaks.
- IPAC must be familiar with management.
- Routine practices are key.
- Healthcare workers current on vaccination.

References

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A microscopic image showing numerous green, rod-shaped bacteria. Each bacterium has a dark, spherical spore at one end. The bacteria are scattered across the field of view, some appearing in small clusters or chains. The background is a light, slightly textured grey.

Questions?