

# **Novel Coronavirus from China: Nuisance Cold Virus or the next SARS?**

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**The Brody School of Medicine at ECU**

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**Medical Director of Infection Control**  
**Vidant Medical Center**

# OBJECTIVES

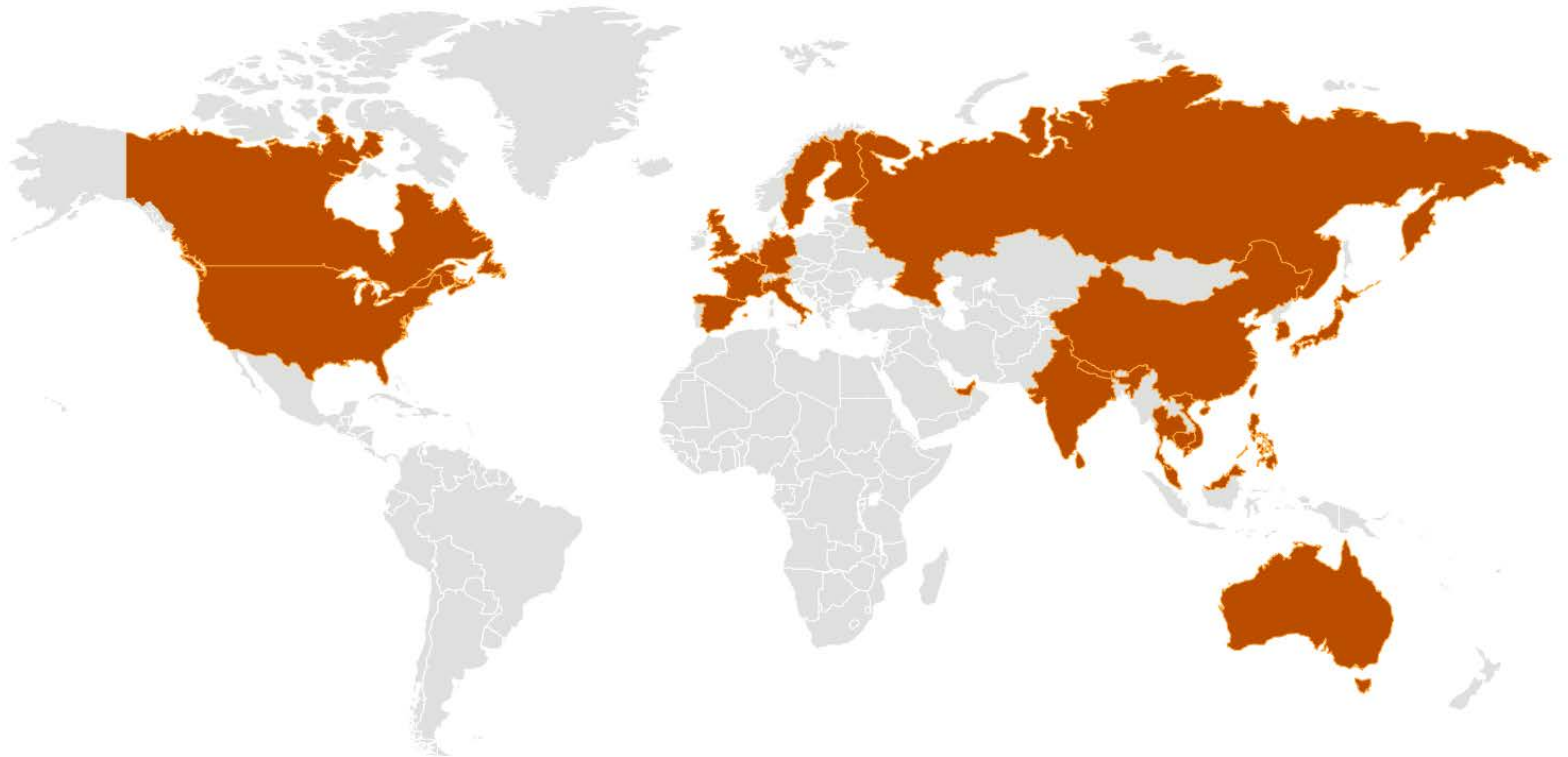
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1. To be able to list the most common Coronavirus strains-vs-Novel Coronavirus
2. To be able to list the methods of diagnosis for a candidate case
3. To be able to place a candidate patient on the proper isolation precautions

# Happy New Year!

- On December 31, 2019, the World Health Organization(WHO) was alerted to several cases of pneumonia in Wuhan City, Hubei Province of China, and the virus detected did not match any other known virus.
- On January 7<sup>th</sup>, Chinese authorities confirmed that they had identified a new virus, a coronavirus, and in the family of viruses that include the common cold, SARS, MERS, and is named “2019-nCoV”
- On January 14, the sequence of 2019-nCoV was published online, and we read of 14 healthcare workers infected in China

# 2019-n-CoV Global Map:\* ? Pandemic



\*As of 2-10-2020

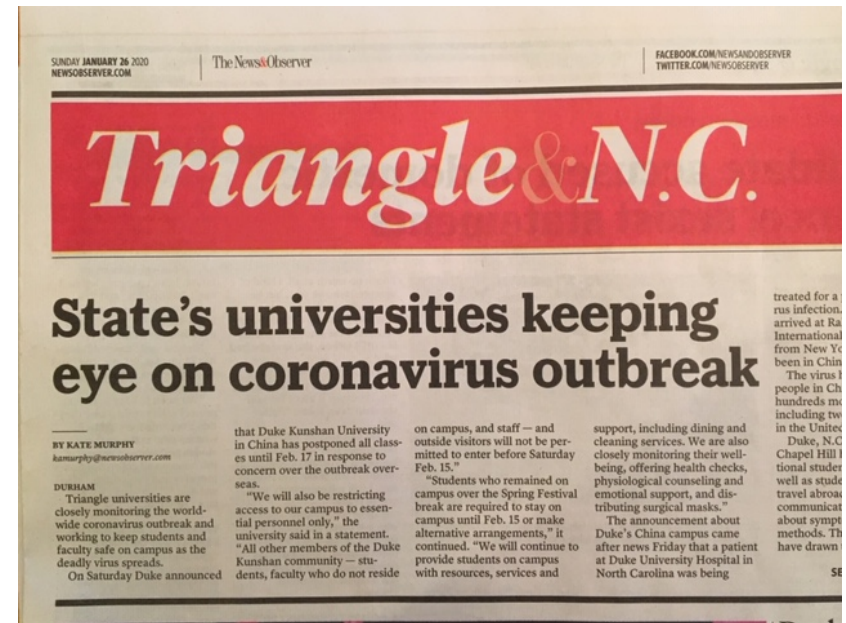
<https://www.cdc.gov/coronavirus/2019-ncov/locations-confirmed-cases.html#map>

# WUHAN CORONAVIRUS OUTBREAK\*

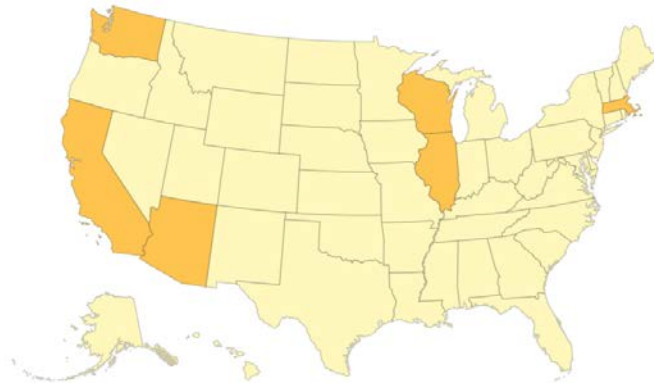
- CORONAVIRUS CASES  
43,143
- DEATHS  
1018
- RECOVERED:  
4336

\* As of 2-11-2020; Worldometer  
<https://www.worldometers.info/coronavirus/>

# The Triangle has its Eye on 2019-n-CoV



# 2019-nCoV in US\*



## 2019 Novel Coronavirus (2019-nCoV) in the U.S.

Updated February 10, 2020

CDC is closely monitoring an outbreak of respiratory illness caused by a novel (new) coronavirus named [2019-nCoV](#). The outbreak first started in Wuhan, China, but cases have been identified in a growing number of other [international locations](#), including the United States. This page will be updated regularly on Mondays, Wednesdays, and Fridays.

### People Under Investigation (PUI) in the United States\*†

Positive	12
Negative	318
Pending‡	68
Total	398

\*Cumulative since January 21, 2020.

†Numbers closed out at 7 p.m. the night before reporting.

‡Includes specimens received and awaiting testing, as well as specimens in route to CDC.

Number of states and territories with PUI: 37

\*as of 2-11-2020

<https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html>

# What is going to happen with 2019-nCoV?



- What is its infectivity?
- What is the incubation period?
- What is the source of the 2019-nCoV?
- What is the mortality rate?
- What measures can we take to prevent it?
- Will it result in a pandemic?
- Will we have a vaccine?



# PATIENT CASE

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A male patient was admitted February 22, 2003 to a Hong Kong hospital in respiratory distress.

He had symptoms of a respiratory tract infection since February 15 in Guangdong Province, China. He died the following day.

# PATIENT CASE

## Differential Diagnosis

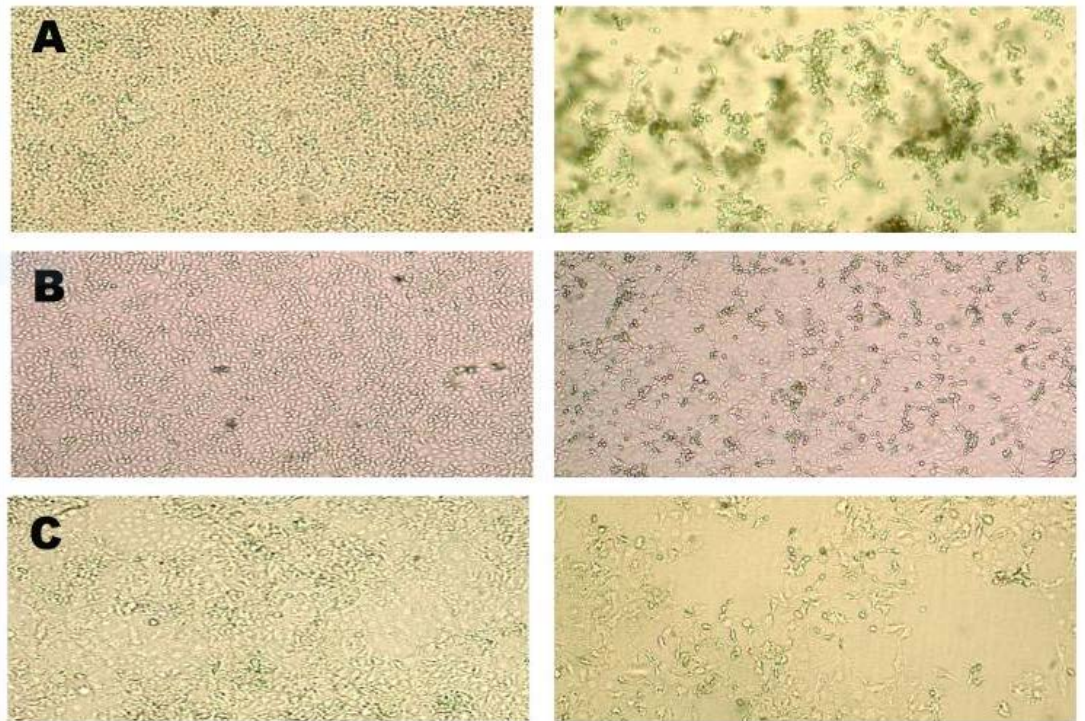
- Influenza A, B
- “Avian Flu”
- Adenovirus
- Hantavirus
- Parainfluenza
- ARDS

# SARS UPDATE

## Search for Pathogen

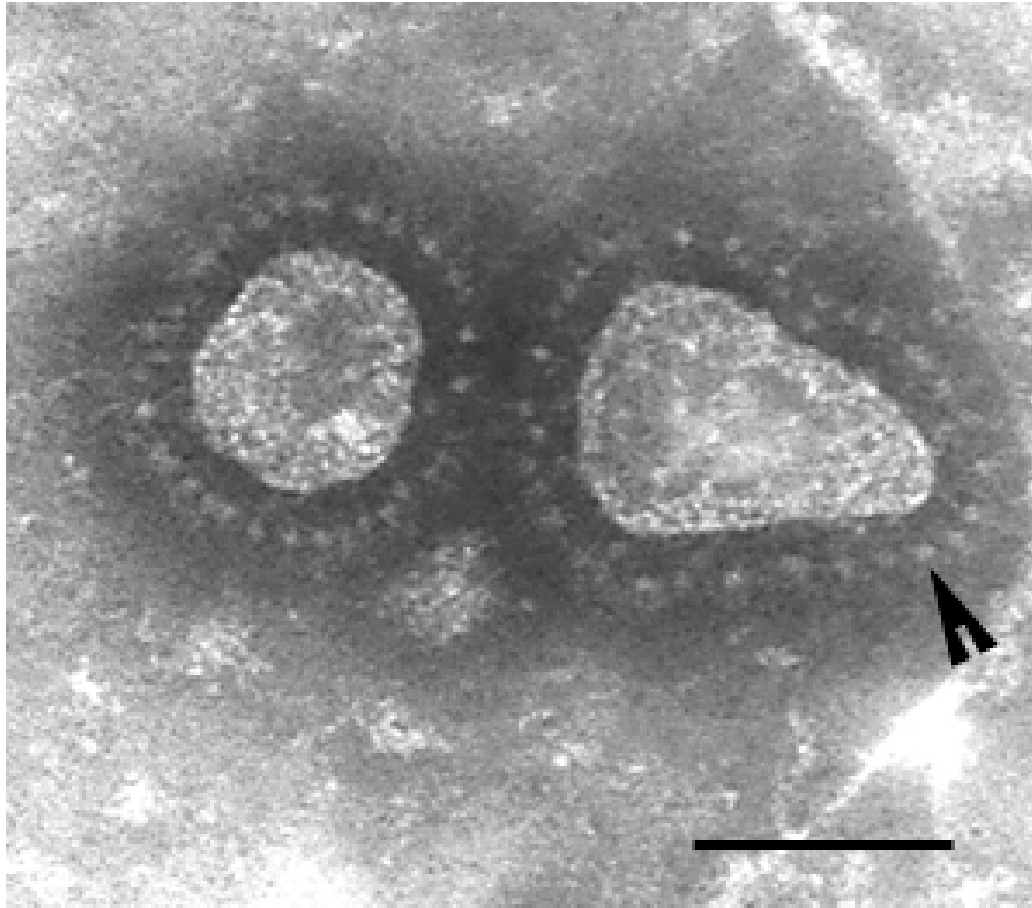
- Lung Pathology
- Lack of isolation of Influenza A or B, Parainfluenza, Adenovirus
- Virus isolation on Vero 6 cells with classic “rounding up”

### Syncytial Giant Cells



Kaye M, Druce J, Tran T, et al. EID. 2006; 12 (1): 128-133.

# Electron Microscopy



# SARS UPDATE

## Search for Pathogen

- EM                      Coronavirus morphology from Canadian and Hanoi cases
- IFA                     Seroconversions with paired sera  
No non-ill controls with antibody
- Viral Sequences – Coronavirus-like  
Agent—distinct from known human isolates OC43 and 229E

# CORONAVIRUSES

- Isolated in 1960 from a child with a common cold among an outbreak in which Rhinovirus was not isolated\*
- 2 human strains known (prior to SARS) 229E and OC43
- Etiology of “winter colds” and uncommon cause of self-limited Pneumonia
- Nosocomial outbreaks among newborns and elderly

\*Kendall, EJC, et al. Br Med J. 1962:82-86

# **Coronavirus Infections in Military Recruits**

**Three-Year Study with Coronavirus Strains OC43 and 229E<sup>1-3</sup>**

**RICHARD P. WENZEL, J. OWEN HENDLEY, JOHN A. DAVIES, and  
JACK M. GWALTNEY, JR.<sup>4</sup>**

**TABLE 3**  
**INITIAL SERUM ANTIBODY TITERS AND**  
**SEROCONVERSIONS TO CORONAVIRUSES**  
**229E AND OC43 IN MARINE RECRUITS,**  
**PARRIS ISLAND, S.C., AND CAMP**  
**LEJEUNE, N.C.**

OC43			229E		
Initial Serum Titer	No. of Convertors* / No. of Men	(%)	Initial Serum Titer	No. of Convertors* / No. of Men	(%)
< 10	5/56	(9)	< 4	12/297	(4)
10	19/108	(18)	4	0/29 <sup>†</sup>	
20	15/113	(13)	8	0/25	
40	3/90	(3) * *	≥ 16	0/6	
≥ 80	0/17				

\* Convertors = men with fourfold antibody rises.



# Pneumonia with Coronavirus OC43 in Adult Recruits

## Respiratory signs and symptoms

	# with results (%)	
Cough	11/11	100%
Sore throat	8/11	72%
Fever > 102°F	6	54%
Sputum	6	54%
Rales	5	45%
Pneumonia (x-ray)	4	36%

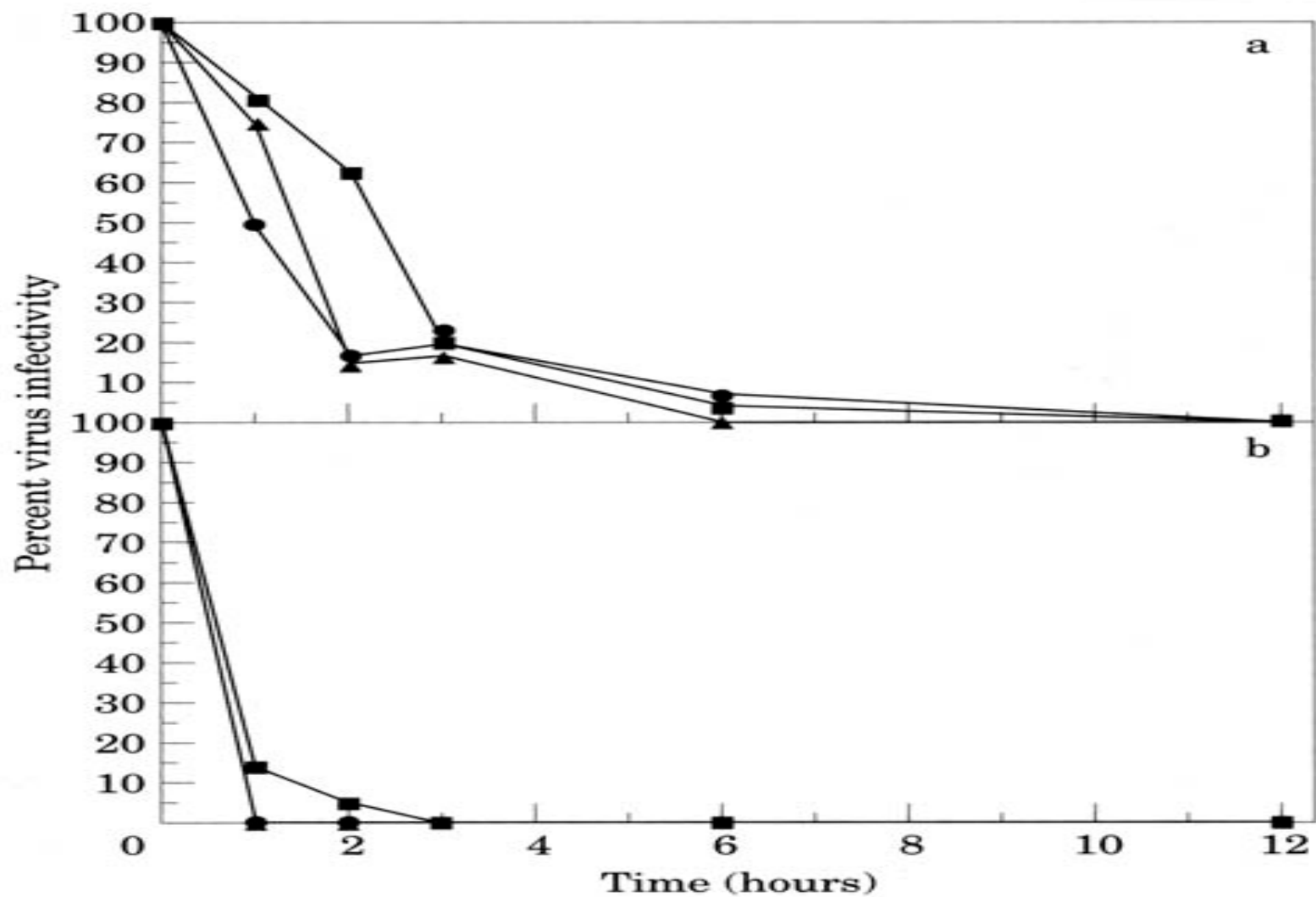
Wenzel, RP, et.al. Rev Resp Dis 1974;109:621

# **Survival of human coronaviruses 229E and OC43 in suspension and after drying on surfaces: a possible source of hospital-acquired infections**

J. Sizun, M. W. N. Yu and P. J. Talbot

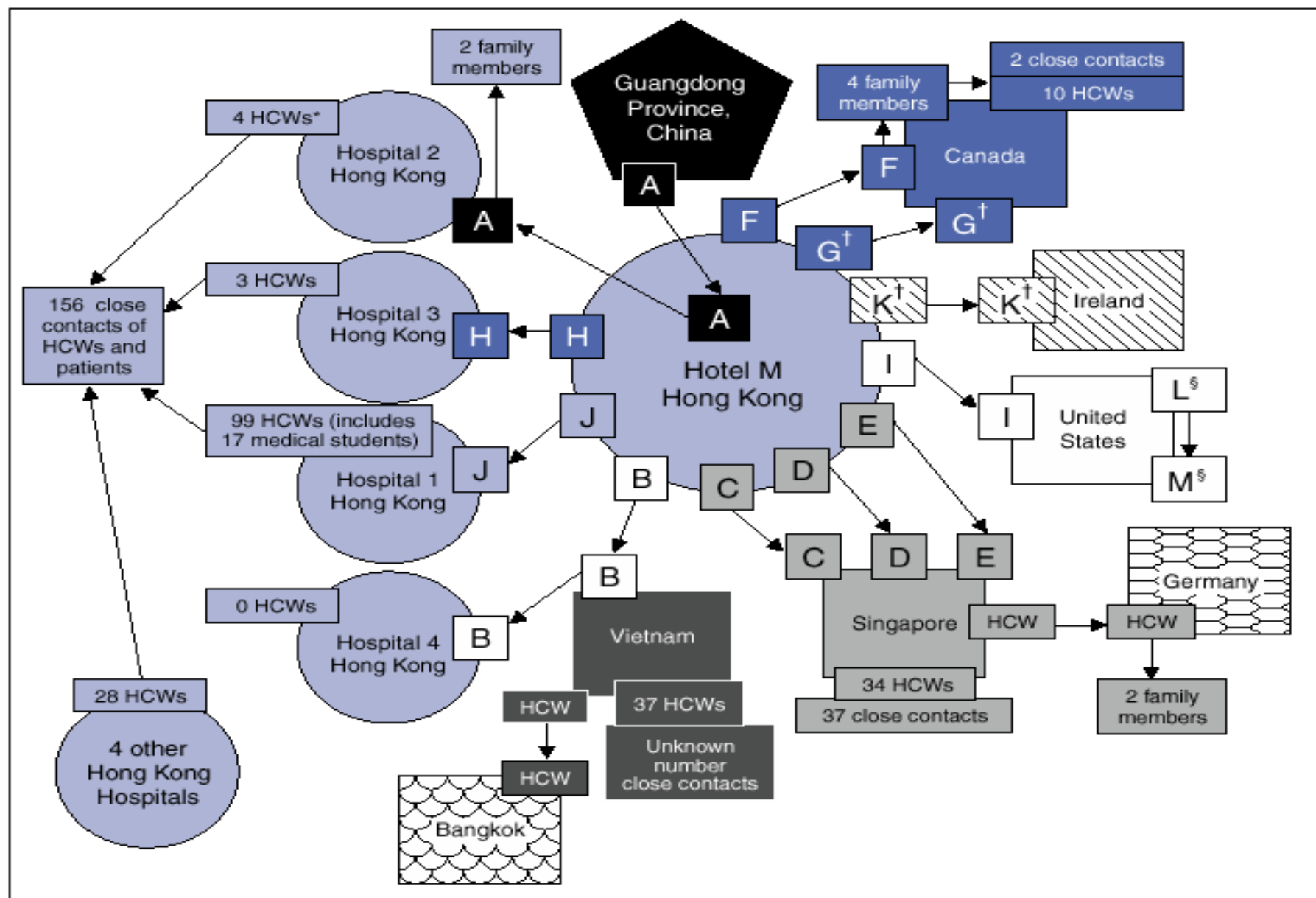
*Laboratory of Neuroimmunovirology, Human Health Research Center, INRS-Institut Armand-Frappier,  
University of Quebec, Laval, Québec, H7V 1B7, Canada*

J Hosp Inf. 2000; 46:55-60



**Figure 2** Infectivity of HCV-229E (a) and HCV-OC43 (b) after drying for various times on various surfaces: either aluminum (■), sterile sponges (●) or latex surgical gloves (▲).

**FIGURE 1. Chain of transmission among guests at Hotel M — Hong Kong, 2003**

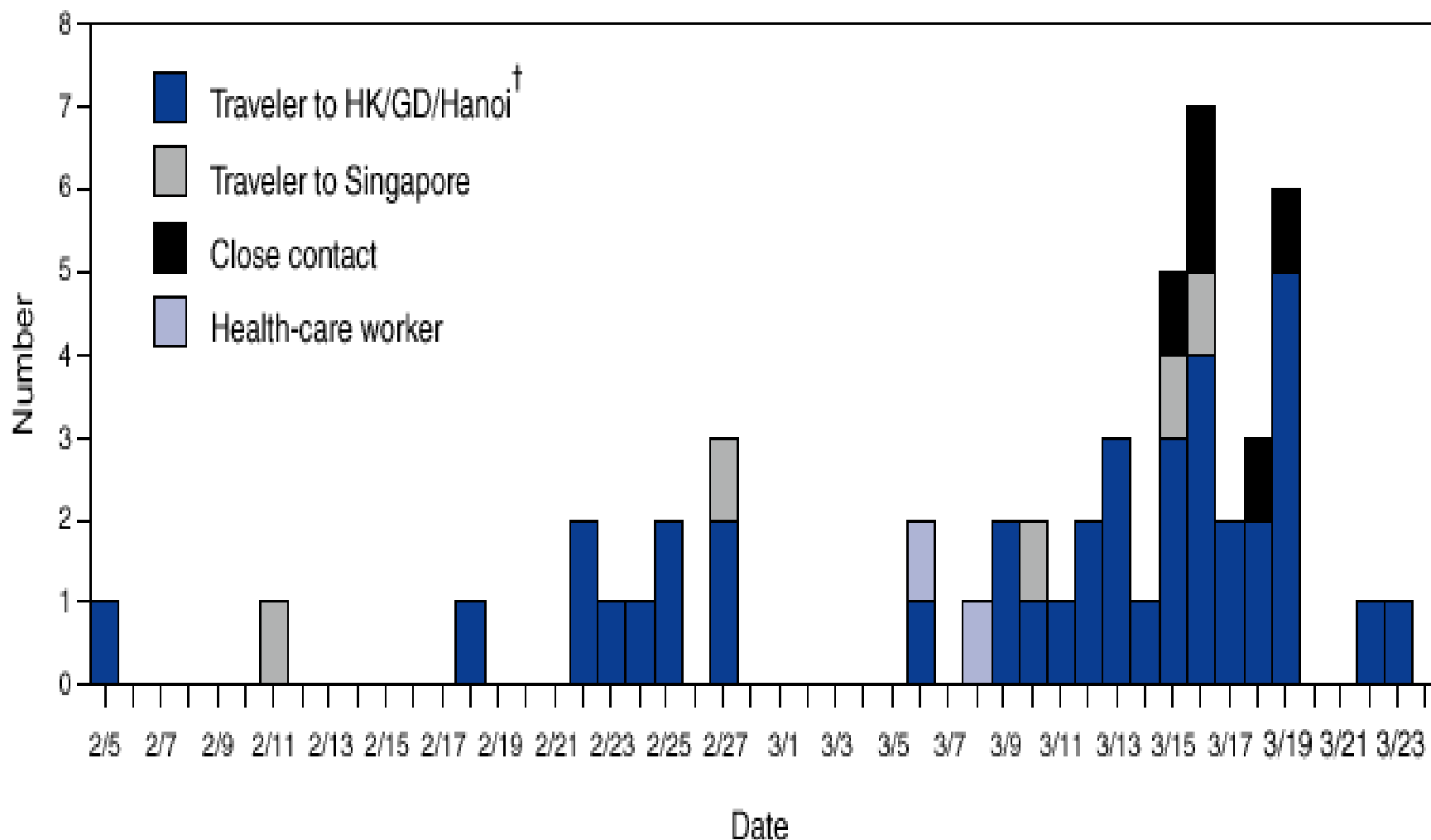


\* Health-care workers.

<sup>†</sup> All guests except G and K stayed on the 9th floor of the hotel. Guest G stayed on the 14th floor, and Guest K stayed on the 11th floor.

<sup>§</sup> Guests L and M (spouses) were not at Hotel M during the same time as index Guest A but were at the hotel during the same times as Guests G, H, and I, who were ill during this period.

**FIGURE 2. Number of suspected cases\* of severe acute respiratory syndrome, by exposure category and date of illness onset — United States, 2003**



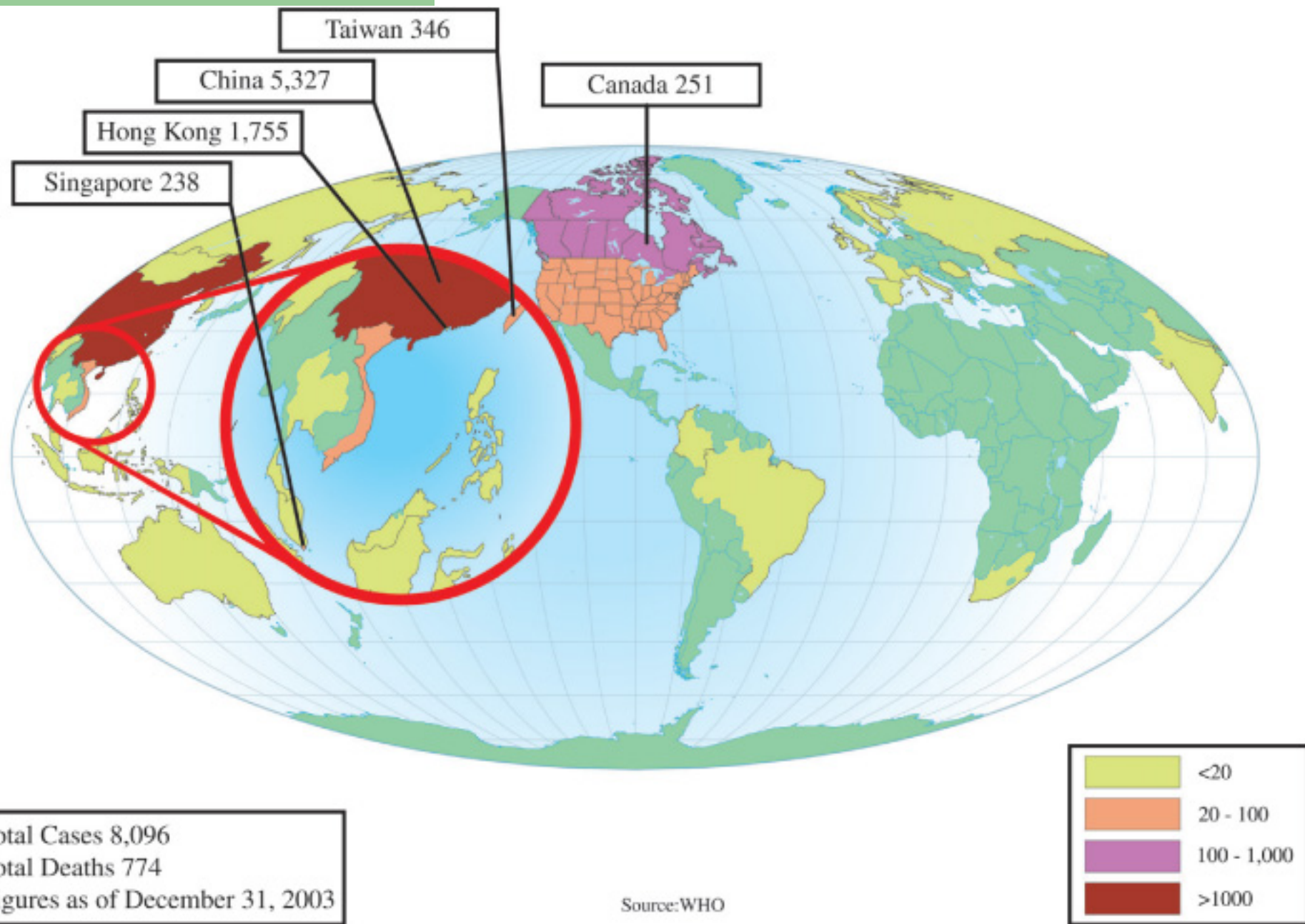
\*N = 51.

<sup>†</sup>HK = Hong Kong Special Administrative Region, China; GD = Guangdong province, China; Hanoi = Hanoi, Vietnam.

# Coronavirus - SARS

- Incubation period from exposure to fever 2-16 da (Mean 6 da)
- Biphasic Disease
- Radiographic picture consistent with atypical pneumonia
- Virus shed in sputum and feces
- Case Fatality Rate: 4 – 7% initially; up to 15% among elderly

<https://www.cdc.gov/sars/about/faq.html>



# INTERIM CDC GUIDELINES

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## To Prevent Transmission of SARS

- Personal protective equipment appropriate for standard contact and airborne precautions
- Eye protection
- N95 Respirators
- Hand Hygiene

<https://www.cdc.gov/sars/infection/index.html>



# Treatment of SARS

- Supportive
- ? Ribavirin
- ? Corticosteroids
- Some isolates of a related Coronavirus, Mouse Hepatitis Virus, are susceptible to Interferon alpha in vitro\*

\*Taguchi F, Siddell, S. Virology 1985;147:41-48

# SARS: 10 Yrs Later

- During 2003, 8096 people in 29 countries got SARS, and 774 died
- Only 8 people in the US had SARS, and none of them died
- In six months, the global SARS outbreak cost the world an estimated \$40 billion
- The last known case was in 2004 among laboratory workers

<https://www.cdc.gov/dotw/sars/>

# Back to the Present: Wuhan, China, Novel Coronavirus

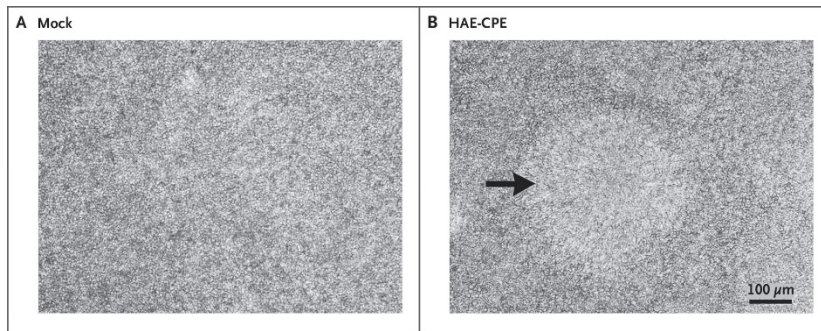
- 41 cases initially
- First case date of onset: 12/6/19
- First international notice 12/31/2019
- Associated with Wet Market



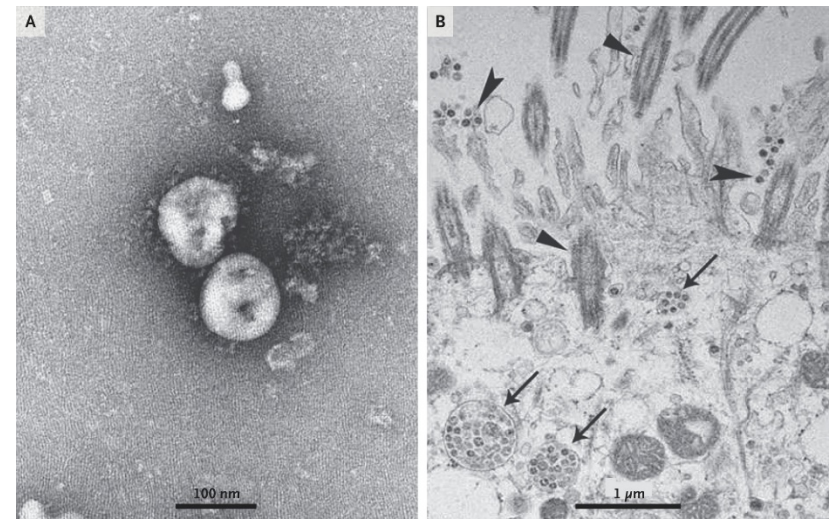
**NY Times 1-26-2020**

# 2019-n-CoV in Cell Culture and EM

## 2019-n-CoV CPE

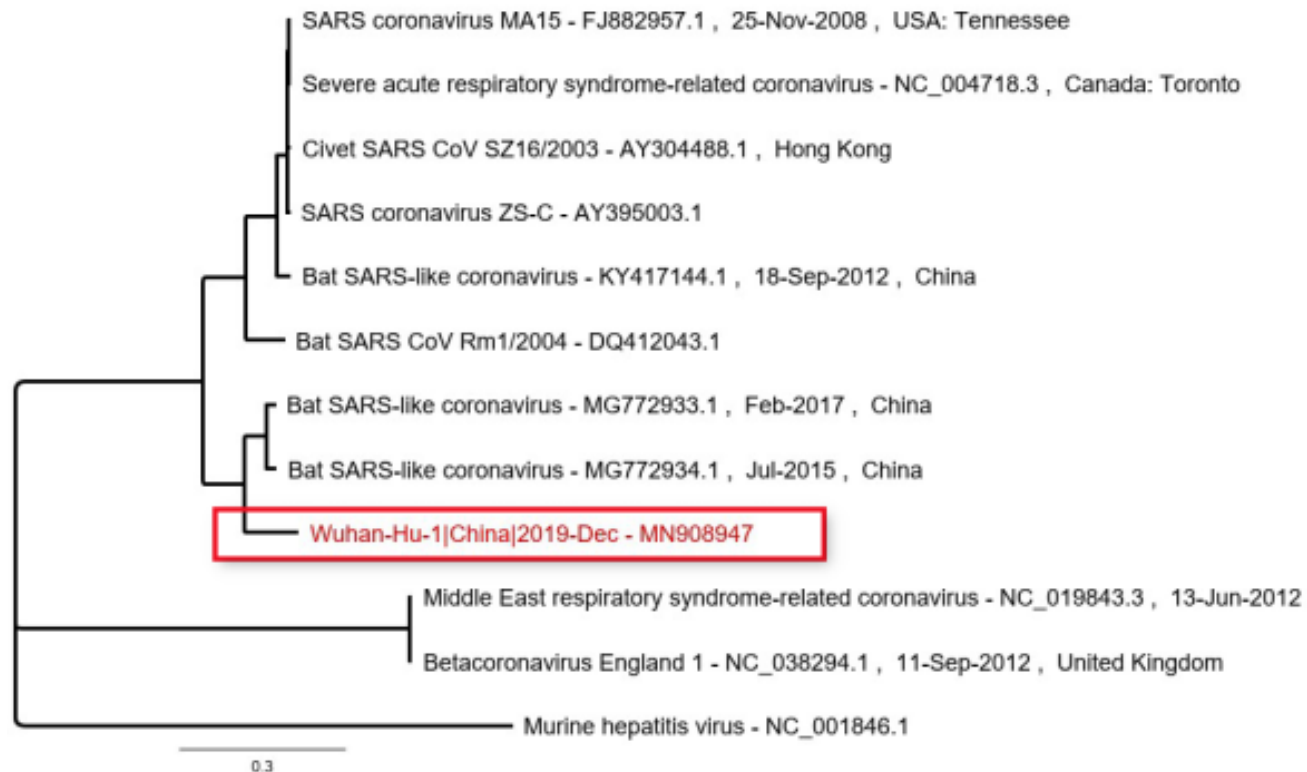


## EM in Lung Tissue



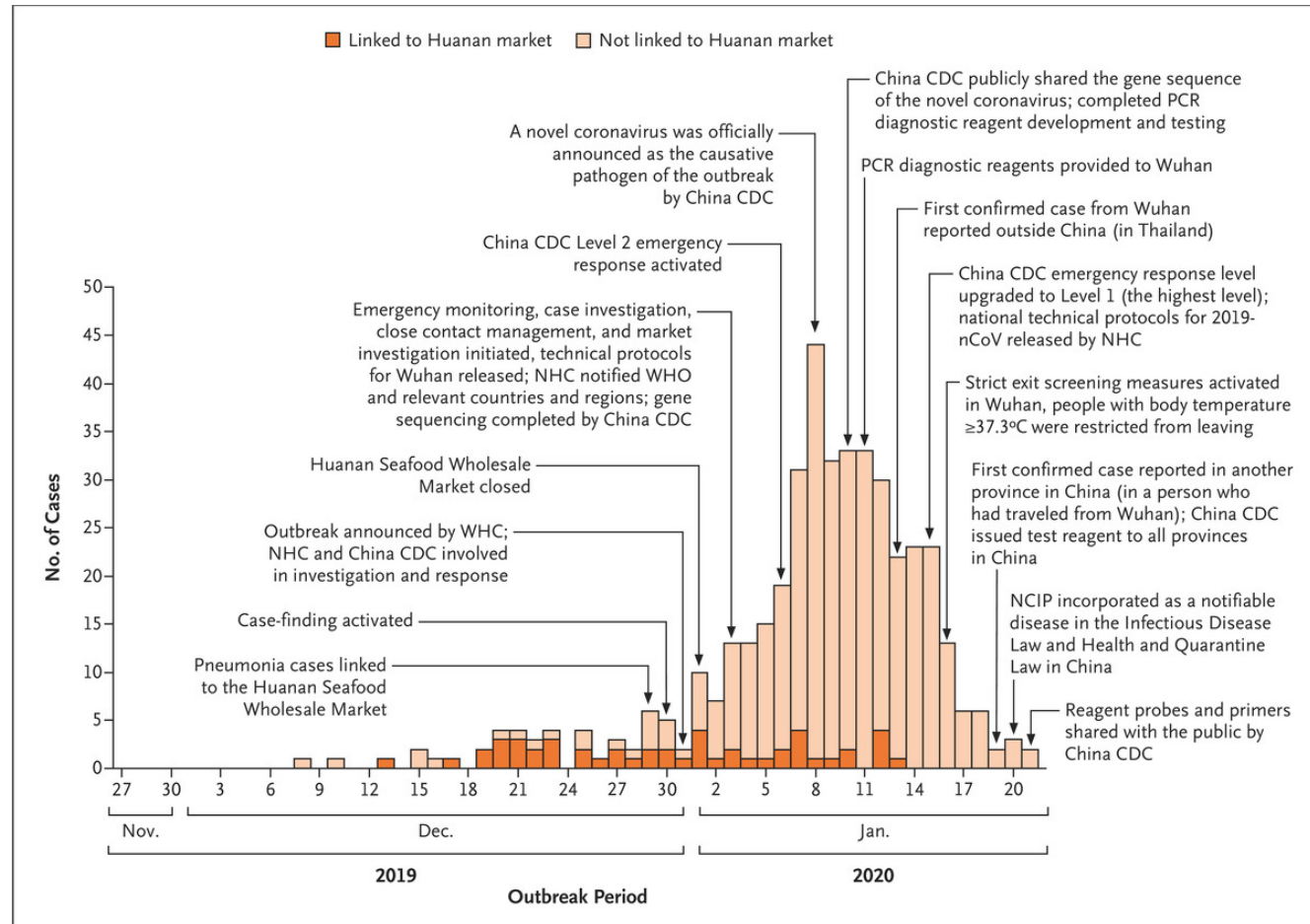
Zhu N, et al. NEJM.2020

# 2019-nCoV Sequenced



Zhou P, Yang X-L, Wang S-G, et al. bioRxiv. 2020

# Outbreak Curve of 2019-nCoV in Wuhan, China



Li, Q, Guan X, Wu P, et al. NEJM. Jan 29, 2020

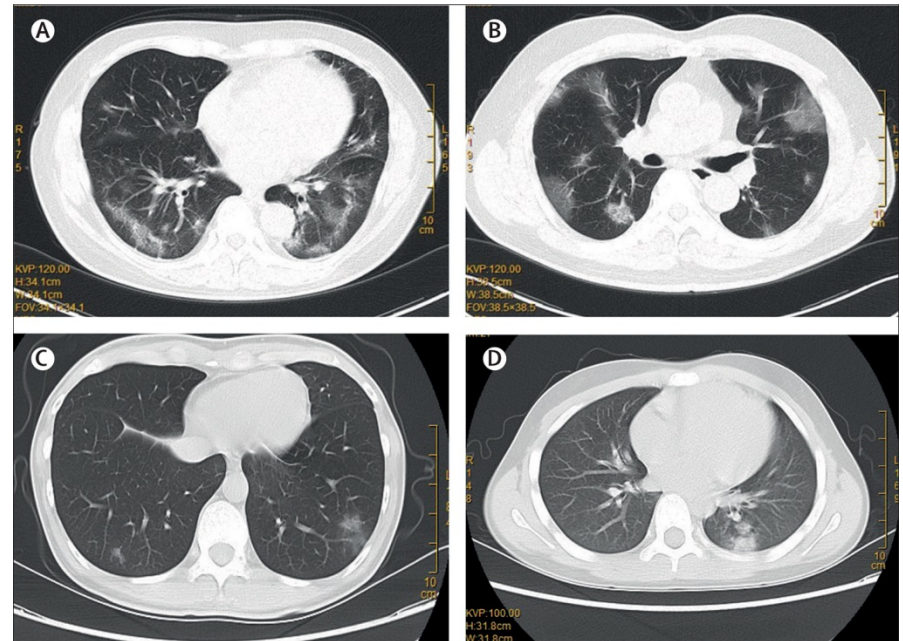
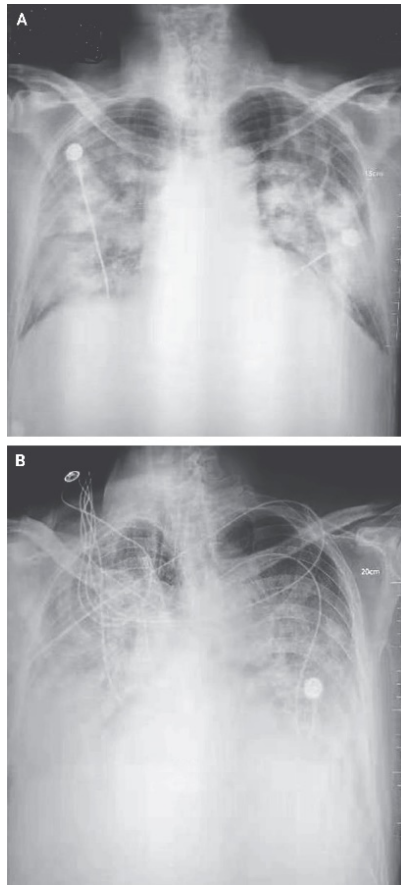
# Clinical Features of Initial 41 Patients infected with 2019-nCoV

- 41 patients admitted in Wuhan: 27/41 (66%) exposed to Huanan seafood market
- Study compared ICU-vs-non-ICU cases for differences by  $\chi^2$  test, Fisher's Exact Test, or Mann-Whitney U test
- Dyspnea and low systolic pressures were the only clinical features with statistical significance:
  - 12/13 (92%)-vs- 10/27 (37%) in non-ICU ( $p = 0.002$ )
  - Lower systolic pressure in ICU cases ( $p = 0.018$ )
  - Most severe cases had lymphopenia, low Procalcitonin, and all cases had bilateral involvement on Chest X-rays
  - ARDS in 12/41; RNAemia in 6/41; 6/41 (15%) died, and 5/13 ICU (32%) died.

Huang C, et al. The Lancet. Jan 24, 2020



# Chest Radiographs and CT Scans of Initial Cases of 2019-nCoV



- Zhu N, et al. NEJM.2020

Chan J F-W, et al. The Lancet Jan 24, 2020



## Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China

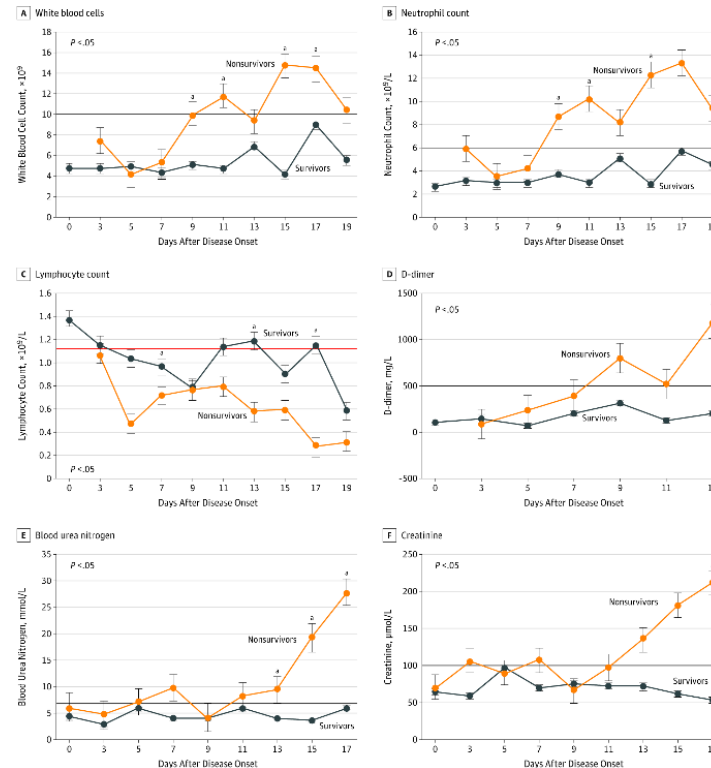


Figure Legend:

Dynamic Profile of Laboratory Parameters in 33 Patients With Novel Coronavirus–Infected Pneumonia (NCIP) Timeline charts illustrate the laboratory parameters in 33 patients with NCIP (5 nonsurvivors and 28 survivors) every other day based on the days after the onset of illness. The solid lines in black show the upper normal limit of each parameter, and the solid line in red shows the lower normal limit of lymphocyte count.

<sup>a</sup> $P < .05$  for nonsurvivors vs survivors.

Date of download: 2/10/2020

JAMA. Published online February 07, 2020. doi:10.1001/jama.2020.1585

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# Case Definition for Novel Coronavirus (2019-nCoV)-infected pneumonia (NCIP) among initial 425 cases

A suspected case is pneumonia that fulfilled all of the following criteria:

1. Fever (with or without recorded temperature);
2. Radiographic evidence of pneumonia;
3. Low or normal WBC or low lymphocyte counts; and
4. No reduction in symptoms after antimicrobial therapy for 3 days

OR

has pneumonia and a link to the seafood market in Huanan, or another case of NCIP.

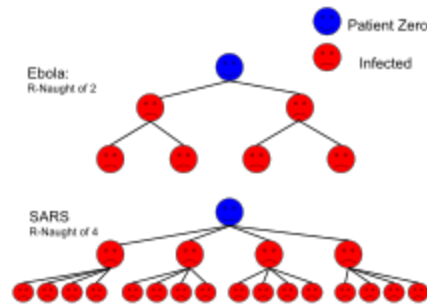
# What is going to happen with 2019-nCoV?



- What is its infectivity?
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- What measures can we take to prevent it?
- Will it result in a pandemic?
- Will we have a vaccine?

# Basic Reproduction number: $R_0$

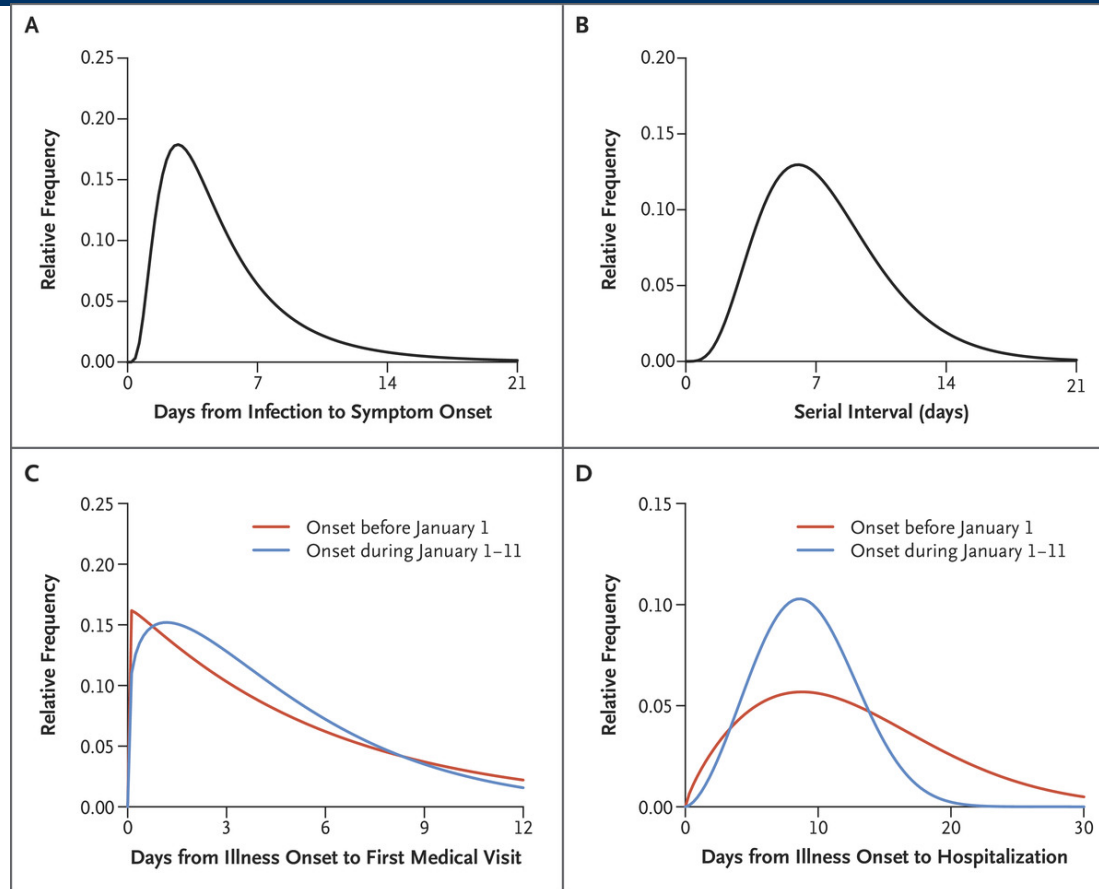
- $R_0$ , or  $R$  nought, of an infection is the number of cases that one case generates on average over time in an uninfected population.



Values of  $R_0$  of well-known infectious diseases<sup>[1]</sup>

Disease	Transmission	$R_0$
Measles	Airborne	12–18
Diphtheria	Saliva	6–7
Smallpox	Airborne droplet	5–7
Polio	Fecal-oral route	5–7
Rubella	Airborne droplet	5–7
Mumps	Airborne droplet	4–7
Pertussis	Airborne droplet	5.5 <sup>[2]</sup>
2019-nCoV	Airborne droplet	2.3–5 <sup>[3][4]</sup>
HIV/AIDS	Sexual contact	2–5
SARS	Airborne droplet	2–5 <sup>[5]</sup>
Influenza (1918 pandemic strain)	Airborne droplet	2–3 <sup>[6]</sup>
Ebola (2014 Ebola outbreak)	Bodily fluids	1.5–2.5 <sup>[7]</sup>

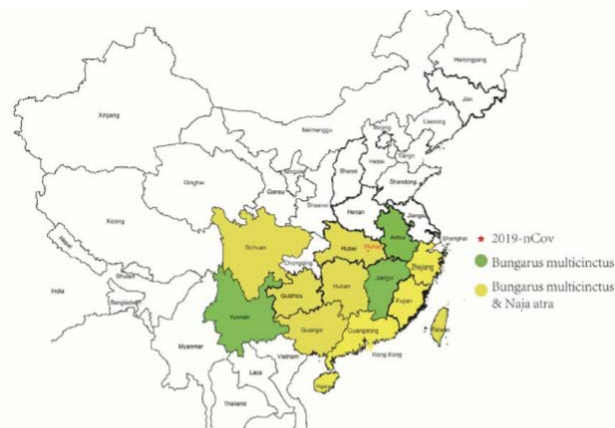
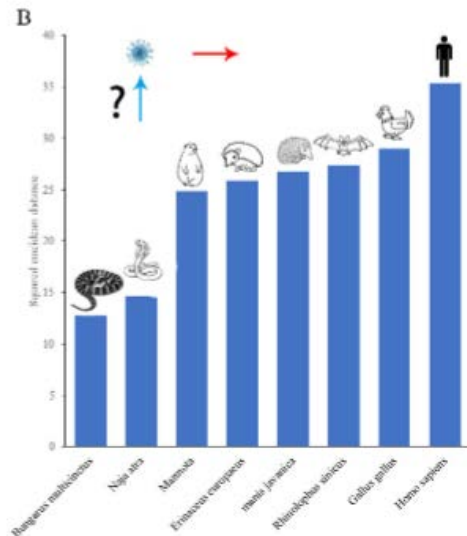
# 2019-nCoV Time Events Estimates



Among the initial 425 cases, the mean incubation period was 5.2 days, and the estimated  $R_0$  value is 2.2 (95% CI, 1.4-3.9).

Li, Q, Guan X, Wu P, et al. NEJM. Jan 29, 2020

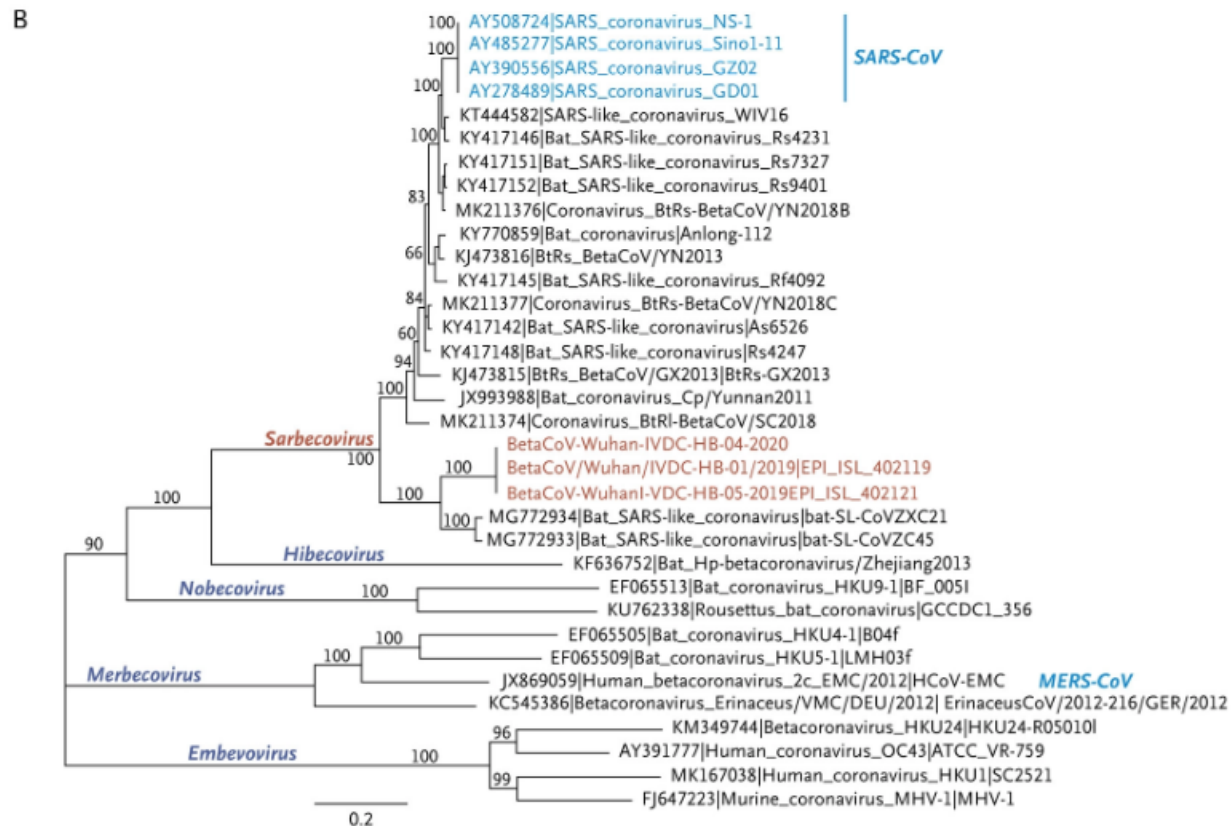
# 2019-n-CoV Genetics and Possible Source(s)



Dr. Ji and colleagues sequenced the 2019-nCoV and noticed some overlaps with both bat and snake coronaviruses; thus, as snakes hunt bats, they theorize that the spike glycoprotein may have recombined in the bat, and now can infect humans

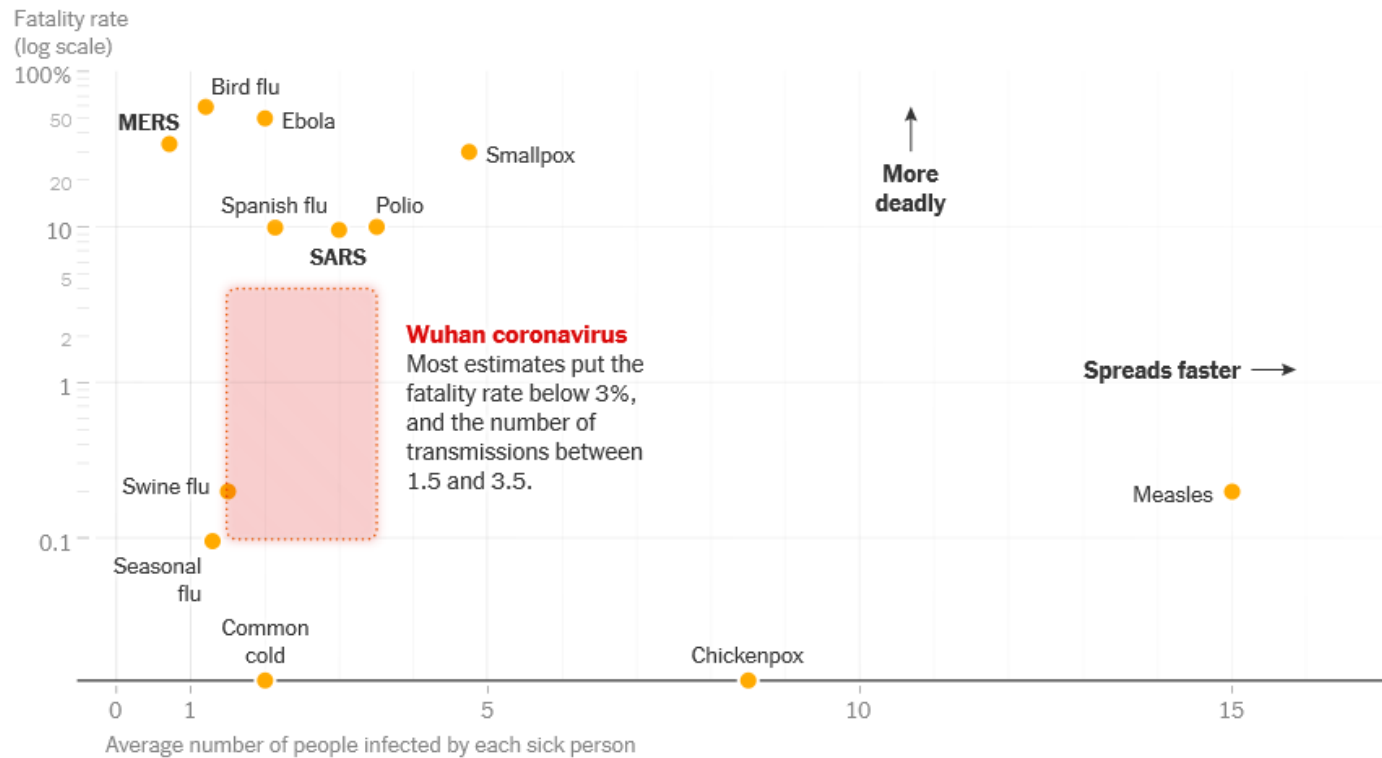
Ji W, Wang W, Shao X, et al. J Med Virology. 22 Jan 2020

# Phylogeny of Human and Bat Coronaviruses



- Ahu N, Zhang D, Wang W, et al. NEJM. Jan 24, 2020
- Wong ACP et al. Global Epidemiology of Bat Coronaviruses. Viruses.2019;11:174

# How Bad Will the Coronavirus Outbreak Get?



Knvul Sheikh, Derek Watkins, Jin Wu and Mika Gröndahl. NY Times, updated Feb. 1, 2020



# Comparison of Recent Severe Coronavirus Infections

Coronavirus	Attack Rate (% exposed who become infected)	Case-Fatality Rate	Comment
SARS	50%	10%	Higher in those over 65 yrs, co- morbidities
MERS	8%	20-25%	
2019-nCoV	??	~ 2%*	Higher in those over 65 yrs of age, co- morbidities

\* As of 1-28-2020

# CDC Travel Health Alert Notice (THAN)



**HEALTH ALERT: *Travelers from China***

There is an outbreak of respiratory illness in China caused by a new coronavirus.

**Watch your health for 14 days after leaving China.**  
If you develop a fever, cough, or have difficulty breathing, seek medical care right away.

- CALL AHEAD BEFORE GOING TO SEE A DOCTOR OR EMERGENCY ROOM.
- TELL THEM YOUR SYMPTOMS AND THAT YOU WERE IN CHINA.
- GIVE THEM THIS CARD.

**Triage Staff/Clinicians:**

- Use standard, contact, and airborne precautions, and eye protection.
- Notify infection control and your state/local health department immediately.

For more information: [www.cdc.gov/nCoV](https://www.cdc.gov/nCoV)

C314423-D 01/26/2020



<https://www.cdc.gov/coronavirus/2019-ncov/travelers/communication-resources.html>

# If a candidate patient presents from the airport or via referral:

- Patients with a cough should be given a surgical mask to wear upon entry to a healthcare facility or transport
- Obtain a travel history – ask about recent travel to China, or exposure to a traveler from China in the last 14 days
- If positive, place the patient into an airborne isolation room, and healthcare workers should wear an N-95 respirator, a face shield, and observe Standard, Contact and Airborne Precautions (ie, gloves and gown)
- Inform Infection Control, who will contact the local Health Department

<https://www.cdc.gov/coronavirus/2019-ncov/infection-control.html>

# Evaluation of Patient Under Investigation (PUI) for 2019-nCoV\*

Clinical Features	&	Epidemiologic Risk
Fever <sup>1</sup> <b>or</b> signs/symptoms of lower respiratory illness (e.g. cough or shortness of breath)	AND	Any person, including health care workers, who has had close contact <sup>2</sup> with a laboratory-confirmed <sup>3,4</sup> 2019-nCoV patient within 14 days of symptom onset
Fever <sup>1</sup> <b>and</b> signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath)	AND	A history of travel from <b>Hubei Province</b> , China <sup>5</sup> within 14 days of symptom onset
Fever <sup>1</sup> <b>and</b> signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath) requiring hospitalization <sup>4</sup>	AND	A history of travel from mainland <b>China</b> <sup>5</sup> within 14 days of symptom onset

The criteria are intended to serve as guidance for evaluation. Patients should be evaluated and discussed with public health departments on a case-by-case basis if their clinical presentation or exposure history is equivocal (e.g., uncertain travel or exposure).

<https://www.cdc.gov/coronavirus/2019-nCoV/hcp/clinical-criteria.html>

\* As of 2-2-2020

# How do you protect yourself when evaluating or transporting a PUI?



## AIRBORNE INFECTION ISOLATION PRECAUTIONS

*Visitors must report to Nursing Station before entering.*



☒ Perform hand hygiene before entering and before leaving room

☒ Wear N95 respirator when entering room  
Visitors see nurse for instruction on proper use.

☒ Keep door closed

☒ Dietary may not enter  
No debe entrar el dietista

### PRECAUCIONES AMBIENTALES

Los visitantes deben presentarse primero al puesto de enfermería antes de entrar. Lávese las manos. Póngase máscara N95 confíto al entrar al cuarto. Mantenga la puerta cerrada. No debe entrar el dietista.



## CONTACT PRECAUTIONS

*Visitors must report to Nursing Station before entering.*



☒ Perform hand hygiene before entering and before leaving room.

☒ Wear gloves when entering room or cubicle, and/or when touching patient's intact skin, surfaces, or articles in close proximity

☒ Wear gown when entering room or patient cubicle or if clothing will touch patient items

☒ Use patient-dedicated or single-use disposable shared equipment or clean and disinfect shared equipment (BP cuff, thermometers) between patients.

### PRECAUCIONES DE CONTACTO

Los visitantes deben presentarse primero al puesto de enfermería antes de entrar. Lávese las manos. Póngase guantes al entrar al cuarto.



## SPECIAL AIRBORNE/CONTACT PRECAUTIONS

*Visitors, including family, must not enter—report to Nursing Station.*

### HEALTH CARE WORKERS MUST WEAR

- N95 Respirator (prior fit test required)
- Gloves
- Gown
- Protective eyewear  
(you must wear goggles for aerosol-generating procedures)

Reminder: HAND HYGIENE must be performed before entering the room and following removal of PPE and leaving the patient's room.

*For questions call the Infection Control Professional.*

### PRECAUCIONES ESPECIALES CONTACTO AÉREO

*Visitantes tienen que reportarse en la estación de enfermeras antes de entrar a este cuarto.*

Antes De Entrar A Esta Habitación Tiene Que Usar Los Sigüentes Artículos De Protección Personal:

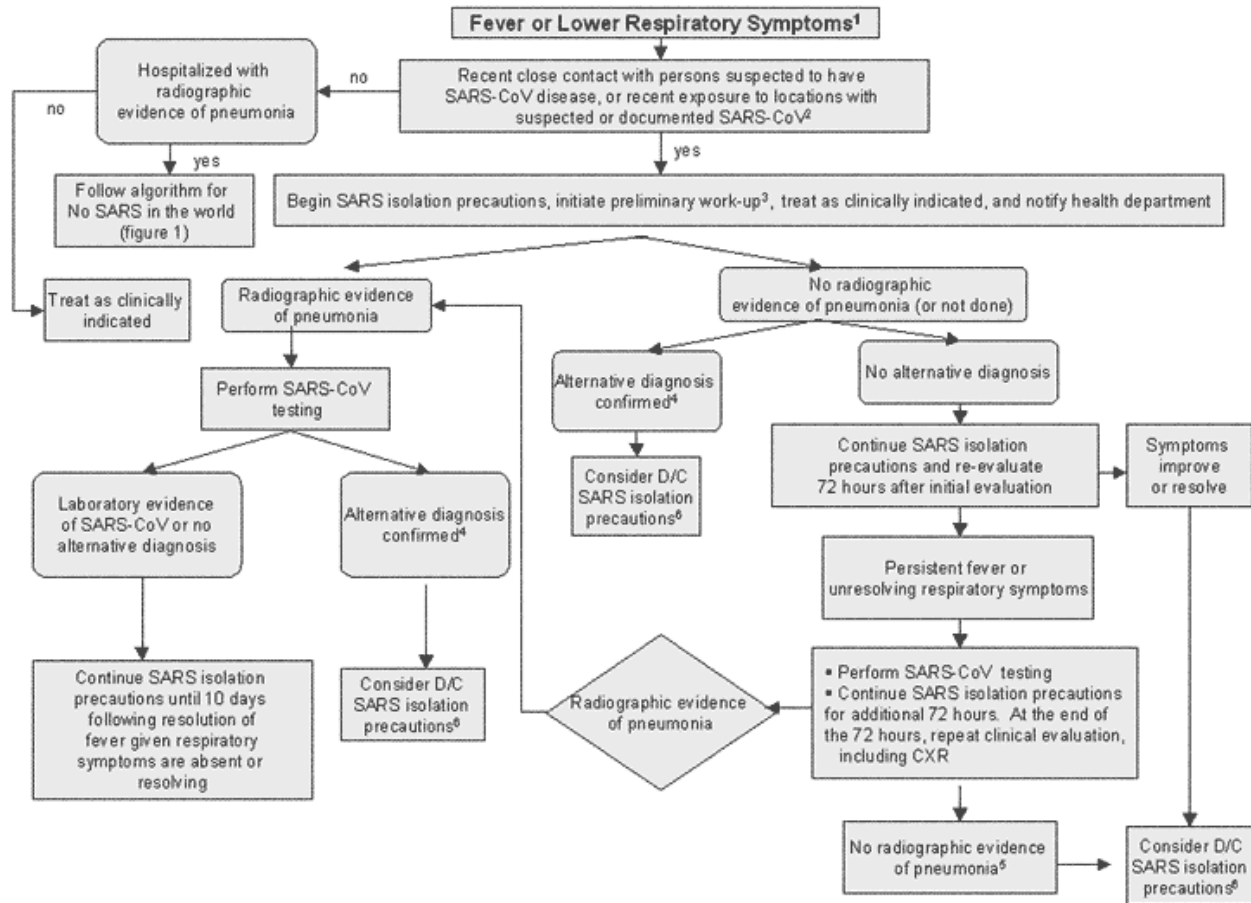
- Respirador N95 (es necesaria prueba de ajuste)
- Guantes
- Bata
- Protección para los ojos  
(Tiene que ponerse anteojos protectores para procedimientos con aerosol)

Recordatorio: Tiene que lavarse las mano antes de entrar a este cuarto, al quitarse los artículos de protección personal y al salir del cuarto.

*Si tiene preguntas llame al Profesional en Control de Infecciones*

# Algorithm for LRI when SARS-CoV person-to-person transmission is occurring in the world

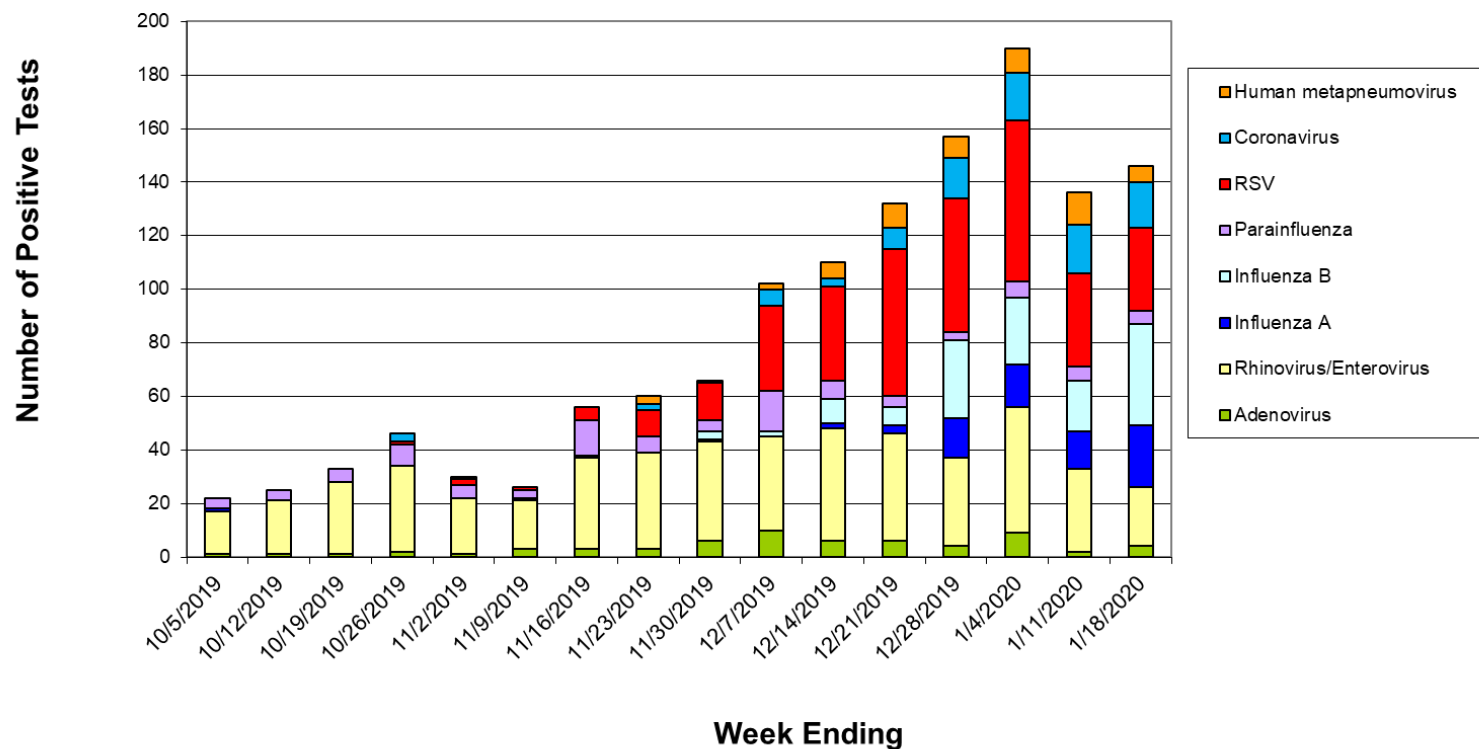
Figure 2: Algorithm for management of fever or respiratory symptoms when SARS-CoV person-to-person transmission is occurring in the world





# Viral Respiratory Panel Detections at VMC - Oct 2019-Present

VMC Weekly Respiratory Virology Surveillance



# Biofire Respiratory Virus Trends in US: 2019-2020

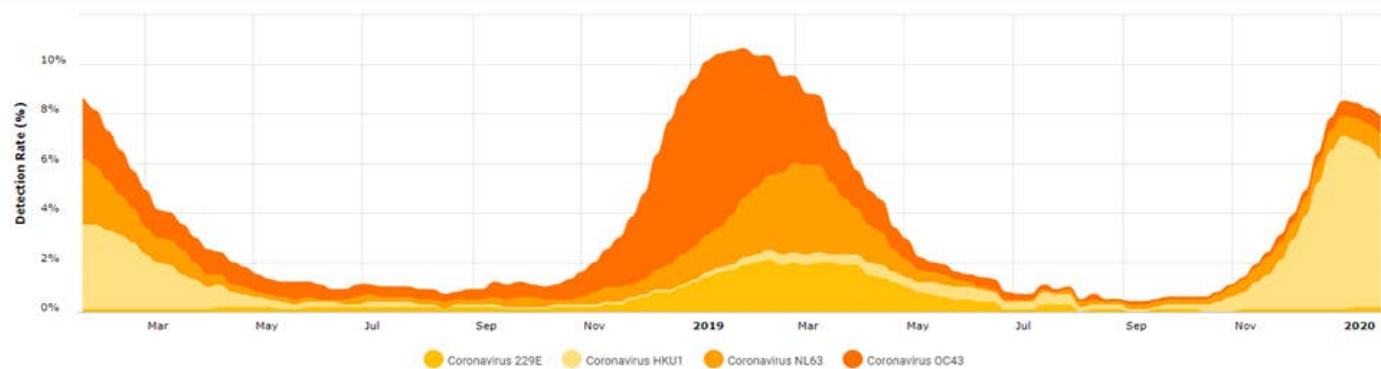
BIO FIRE<sup>®</sup> Syndromic Trends



## Respiratory Pathogen Trends



CHART



← Back To All Groups

Adenovirus

Bacteria

Coronavirus

Human Metapneumovirus

Human Rhinovirus/Enterovirus

Influenza A

Coronavirus 229E



Coronavirus HKU1



Coronavirus NL63



Coronavirus OC43

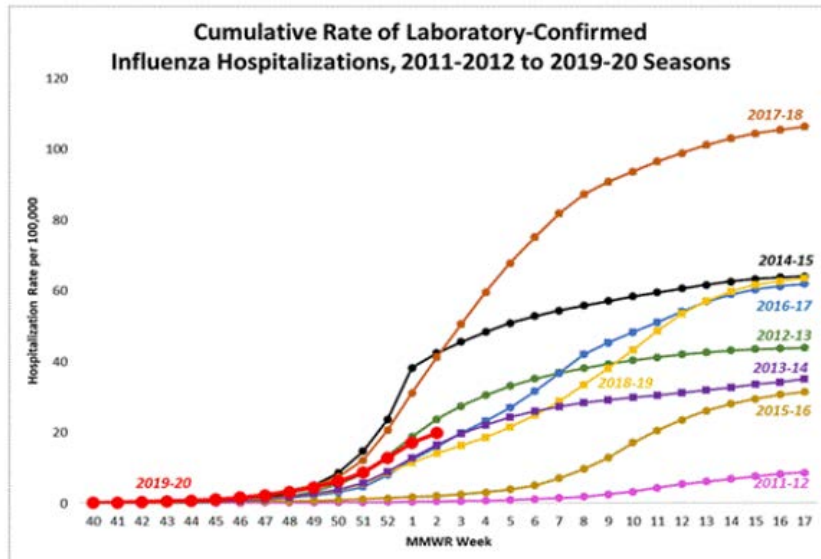


Parainfluenza

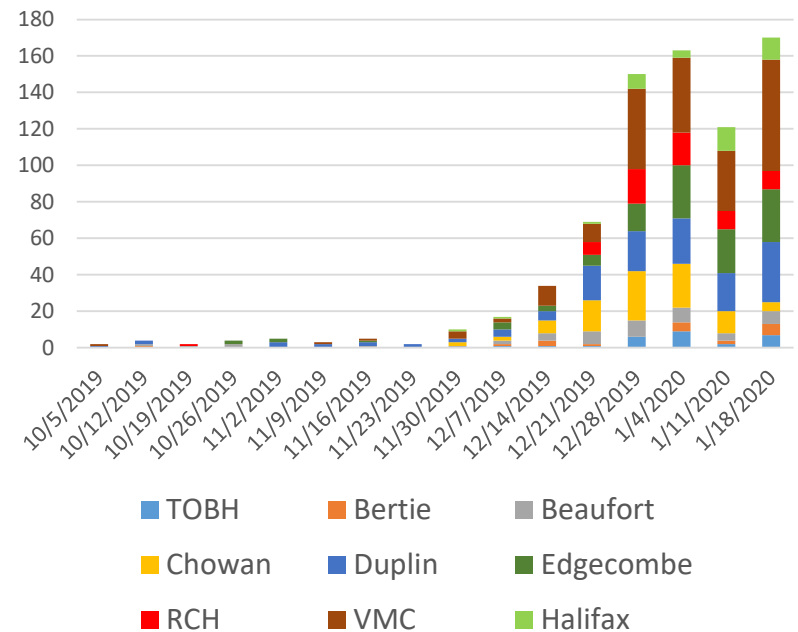
Respiratory Syncytial Virus



# Influenza Season 2019-2020



Vidant Health Hospital Laboratories  
Weekly Number of Positive Influenza Tests



# Adding Names to the Responsibilities

1. Surveillance  
Bill Cleve, Jacci Thomas
2. Information Systems IS  
Karen Bolen
3. Education  
Tracy Langston
4. Infection Control and EVS  
Dr. Ramsey, Kathy Cochran, Jamie Hall;  
Robert White, EVS
5. Communications  
Brian Wudkwyh, Jason Lowery
6. Facility Access – visitation  
Julie Oehlert
7. Facility Security  
Gary Askew
8. Human Resources, Employee Illness  
Janet McKinney
9. Pharmacy  
Jim Worden
10. Triage  
Dr. Patterson, Dr. Bennett, Christine Walden,  
Michelle Kent
11. Medical Care & Respiratory  
Dr. Paul Bolin, Dr. Dalzell, Dr. Paul Cook, Dr. Obi,  
Skip Bangley,  
Mike Coogan
12. Laboratory  
Dr. John Fallon, Rick Ross, Heather Duncan,  
Chris Miller
13. Transfer Center  
Dr. Tracy Eskra
14. Surge Capacity  
Brian Floyd, Van Smith, Dr. Paul Camnitz, Kiplan  
Clemmons, Chris Starbuck
15. Bed Capacity and Bed Control  
Melanie Porter
16. Staffing  
Linda Hofler
17. Consumable Supplies and Equipment  
Ricky Vandiford, Jamie Hall
18. Postmortem Care  
Dr. Karen Kelly
19. COOP  
Linda Hofler, Melanie Porter, Vicki Phillips,  
Latasha Williams, Susan Fawcett

# Final Questions on 2019-nCoV

**When might a vaccine become available?**

- Dr. Anthony Fauci, Head of the NIAID in Bethesda, says it will take a year

**What is the new WHO designation for 2019-nCoV?**

- COVID-19, for Novel Coronavirus Disease 19

# Ramsey's Conclusions

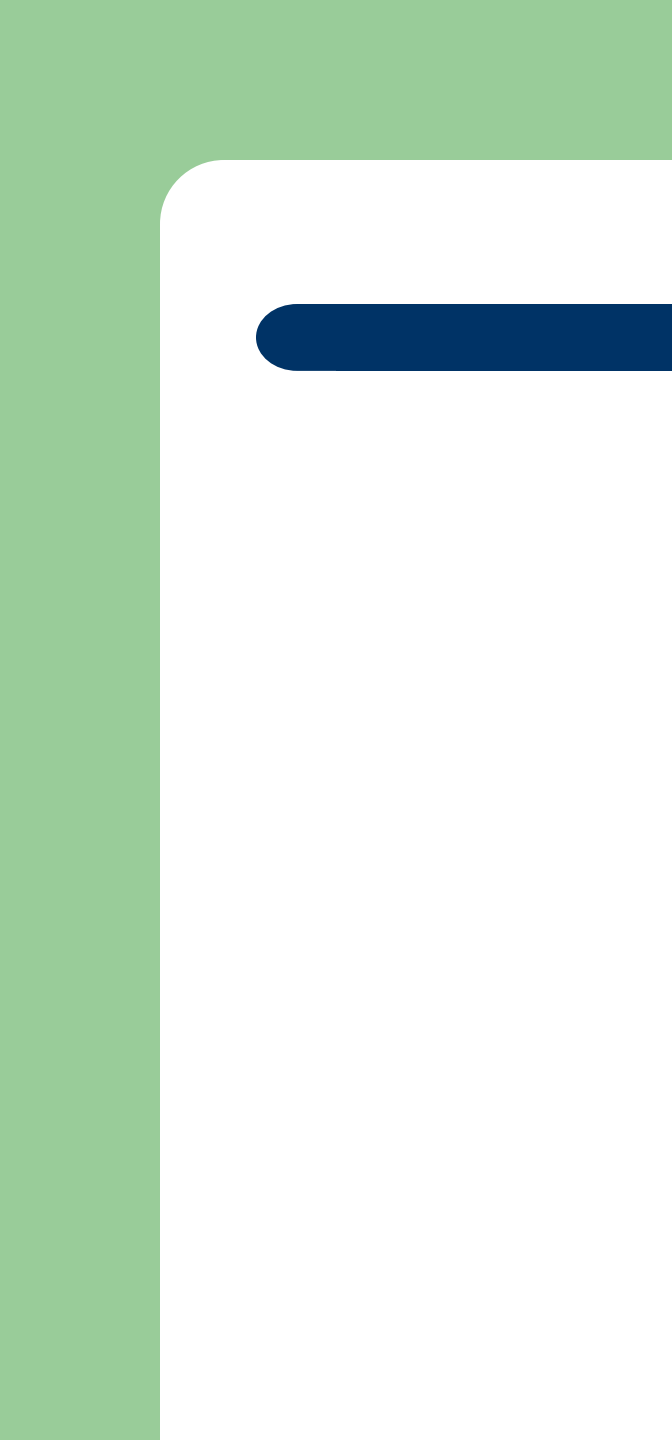
- Vidant and ECU policies and practices toward patients with respiratory symptoms are sound.
- Vigilance and compliance with our practices should reduce if not prevent exposures.
- If we do have cases in the US, with both a lower  $R_0$  value of 2.2 for infectivity and a lower mortality rate of 2% than SARS, they will be less spread and with a lower mortality.
- The 2019-nCoV, will run it's course, and likely decrease if not disappear in the summer months

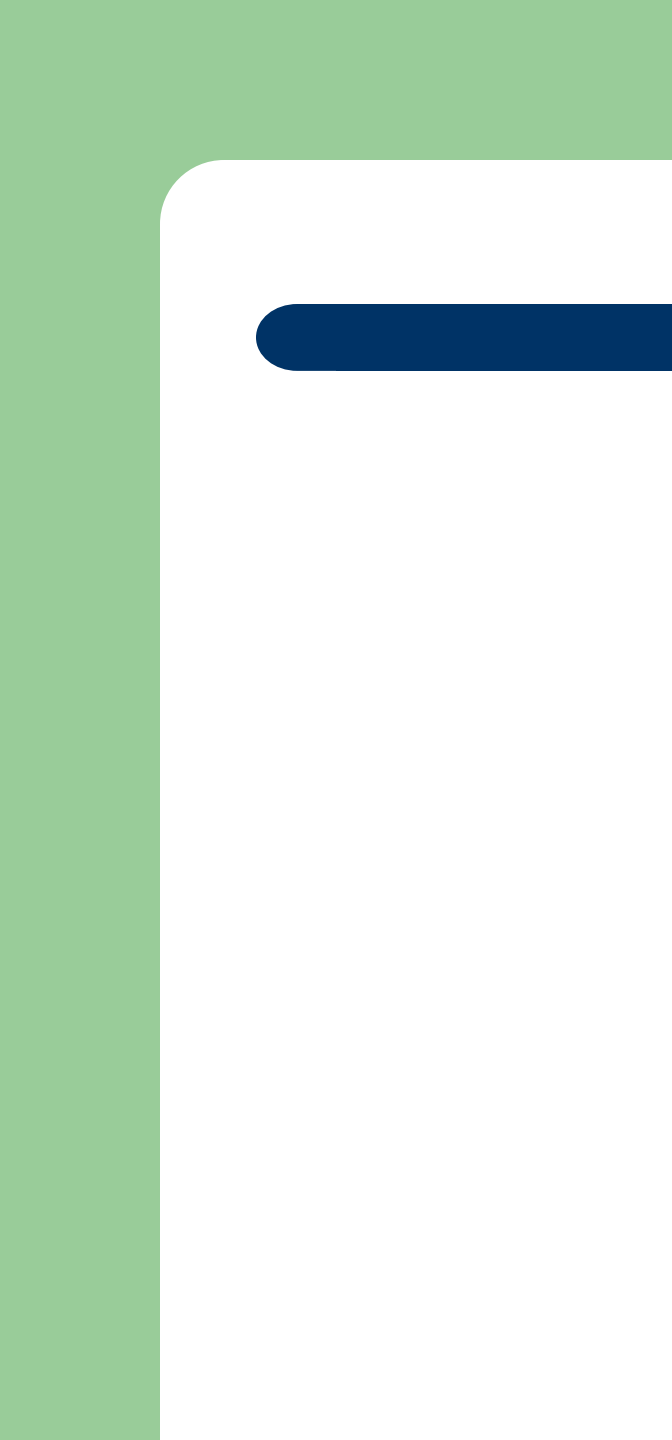
# Novel Coronavirus from China: Nuisance Cold Virus or the next SARS?



Be a virus, see the world.

- Thank you for your attendance!
- Questions?



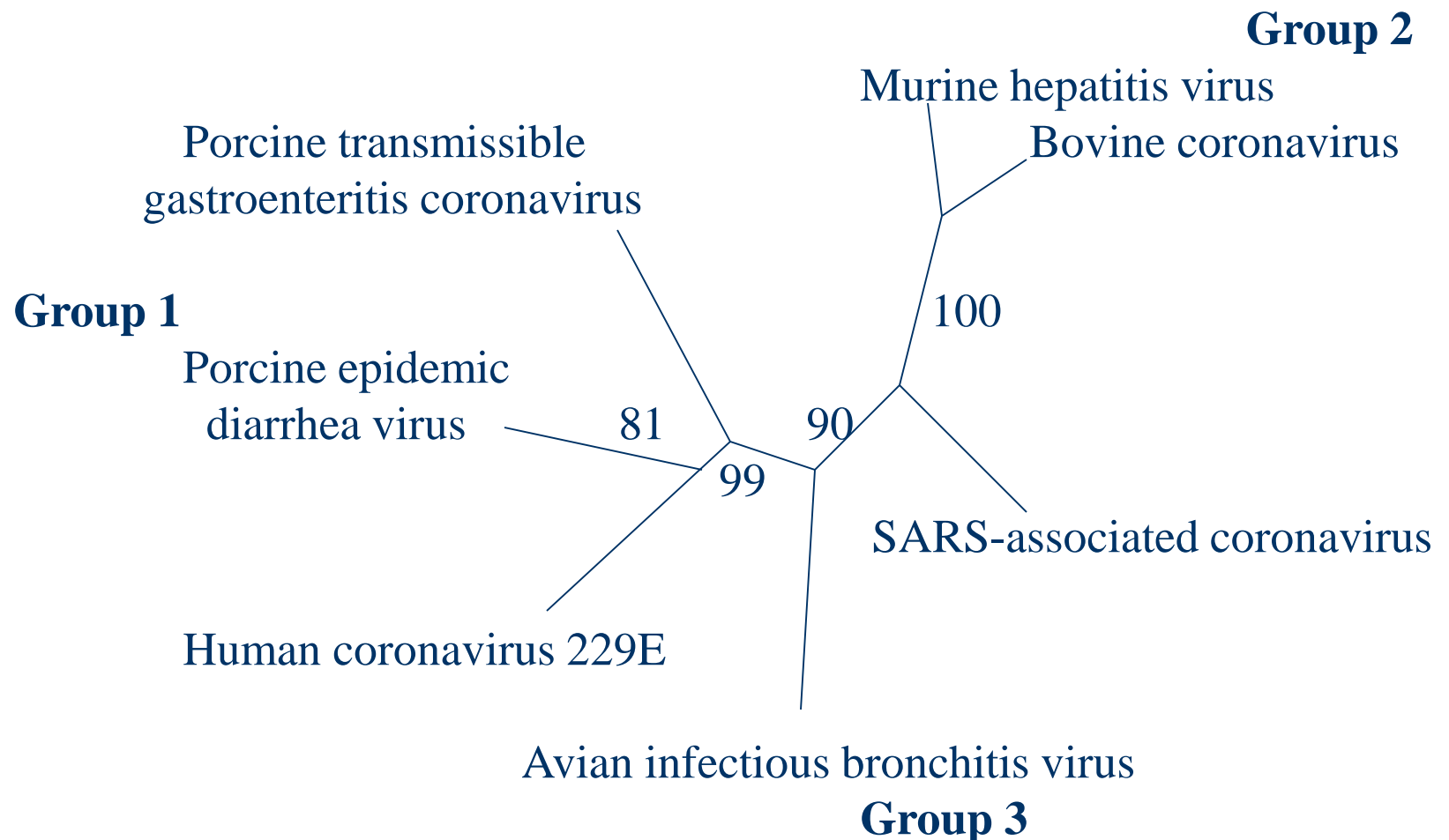


# 19 VMC Hospital Functions to Plan

1. Surveillance
2. Information Systems IS
3. Education
4. Infection Control
5. Communications
6. Facility Access - visitation
7. Facility Security
8. Human Resources, Employee Illness
9. Pharmacy
10. Triage
11. Medical Care
12. Laboratory
13. Transfer Center
14. Surge Capacity
15. Bed Capacity and Bed Control
16. Staffing
17. Consumable Supplies and Equipment
18. Postmortem Care
19. COOP



# A Novel Coronavirus in Patients with SARS



# Clinical Features of the Canadian Patients with SARS at Presentation

Variable	# with results (%)	
Investigations		
■ Aspartate aminotransferase (>1.5 x upper limit of normal)	■ 7 / 9	(78)
■ Alanine aminotransferase (>1.5 x upper limit of normal)	■ 5 / 9	(56)
■ Creatine kinase (above upper limit of normal)	■ 5 / 9	(56)

# Classification of Coronaviruses

- Group I: Hu Cov – 229E
- Group II: Hu CoV – Oc43
- Group III: SARS – CoV
- CVLPs
- Toroviruses

# Clinical Features of the Canadian Patients with SARS at Presentation

Variable	# with results (%)
Symptoms	
■ Fever	■ 10 / 10 (100)
■ Nonproductive cough	■ 10 / 10 (100)
■ Dyspnea	■ 8 / 10 (80)
■ Malaise	■ 7 / 20 (70)
■ Diarrhea	■ 5 / 10 (50)
■ Chest pain	■ 3 / 10 (30)
■ Headache	■ 3 / 10 (30)
■ Sore throat	■ 3 / 10 (30)
■ Myalgias	■ 2 / 10 (20)
■ Vomiting	■ 1 / 10 (10)

# Open Air Markets in Wuhan and other cities in China



NY Times 1-26-2020

# Epidemiological Work-up of Unidentified Pneumonia in China

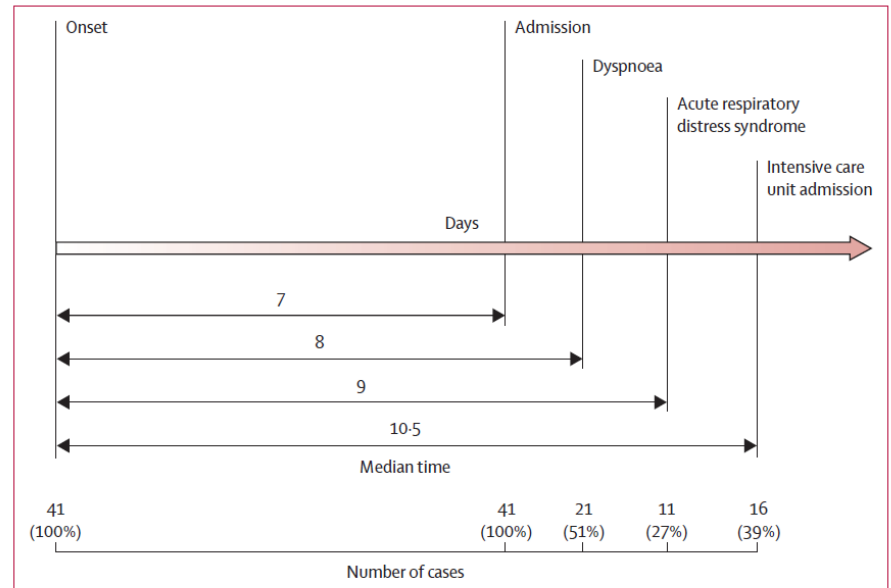
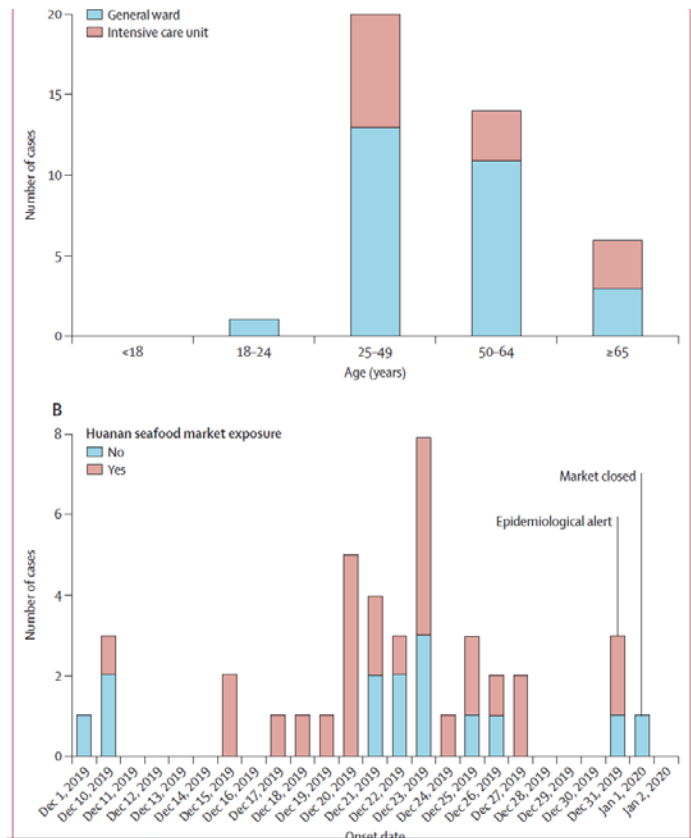


Figure 2: Timeline of 2019-nCoV cases after onset of illness

Huang C, et al. The Lancet. Jan 24, 2020



# Clinical Features of the Canadian Patients with SARS at Presentation

## Variable

### Investigations

### # with results (%)

- |   |               |
|---|---------------|
| ■ Infiltrate on chest radiography                           | ■ 9 / 9 (100) |
| ■ Oxygen saturation on room air < 95%                       | ■ 7 / 9 (78)  |
| ■ Leukopenia (cell count < $4 \times 10^9$ / liter)         | ■ 2 / 9 (22)  |
| ■ Lymphopenia (cell count < $1.5 \times 10^9$ / liter)      | ■ 8 / 9 (89)  |
| ■ Thrombocytopenia (cell count < $130 \times 10^9$ / liter) | ■ 3 / 9 (33)  |
| ■ Lactate dehydrogenase (above upper limit of normal)       | ■ 4 / 5 (80)  |



# Toronto, Canada / April 15-21, 2003

Characteristics of 11 Health-care workers who had symptoms of SARS following exposure to the index patient during the time of his intubation

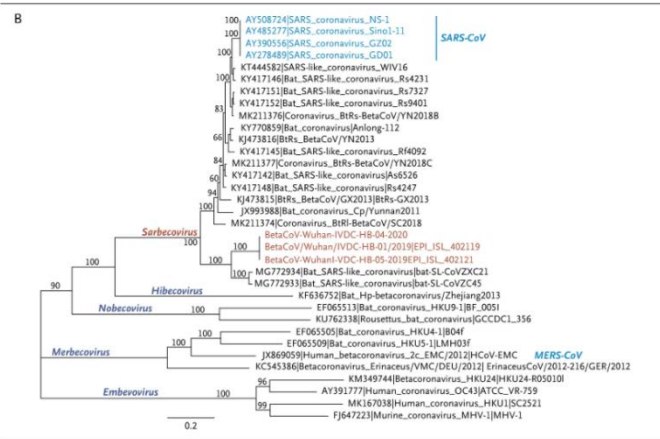
HC Worker	Symptom onset date	Suspect or Probable SARS	Occupation
1	April 15	Suspect	Respiratory therapist*
2	April 16	Suspect	ICU Nurse assigned primarily to another pt*
3	April 16	Suspect	ICU Primary Nurse*
4	April 16	Suspect	Respiratory Therapist*
5	April 16	Probable	Ward Physician **
6	April 17	Probable	ICU Physician*
7	April 17	Suspect	ICU Charge Nurse*
8	April 18	Suspect	ICU Physician*
9	April 18	Suspect	Radiology Technician***
10	April 18	Not a case	ICU Nurse assigned primarily to another pt****
11	April 21	Not a case	ICU Physician****

\*Provided care before, during, & after intubation in ICU. \*\*Examined pt on ward during morning of April 13. \*\*\*Performed Chest radiograph of pt on ward early am April 13

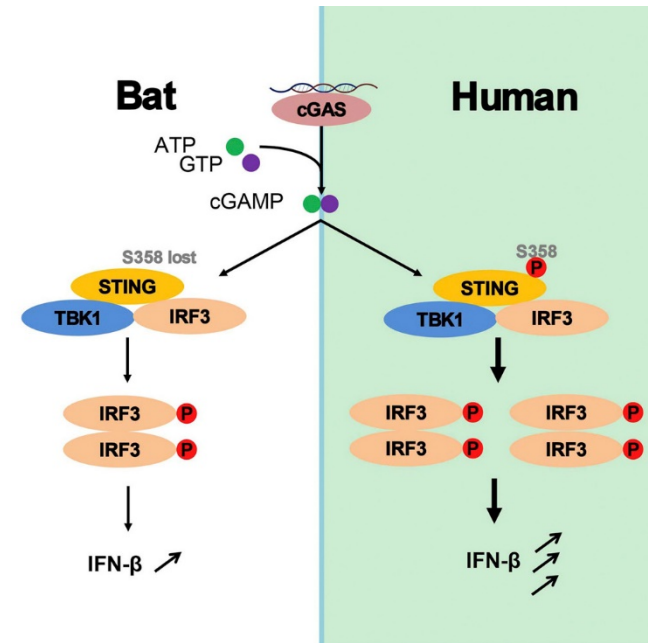
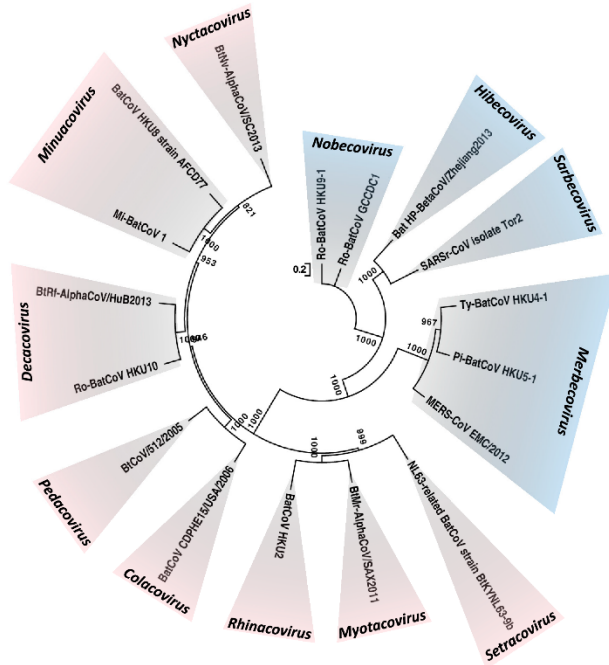
\*\*\*\*Provided care before intubation in ICU

## Phylogeny

## Families of Bat Coronaviruses



# 2019-n-CoV Genetics and Possible Source(s)



Researchers have found that bats carry many coronaviruses; due to replacement of S358 sequence of STING, they have a decreased Interferon response to DNA antigens; thus they may be immunotolerant

Wong ACP et al. Global Epidemiology of Bat Coronaviruses. *Viruses*.2019;11:174  
Xi J, et al. Cell Host and Microbe.2018; 27 (3): 297-301

# Prognostic Indicators for first