

An electron micrograph showing several coronavirus particles. The particles are roughly spherical with a distinct outer layer and a darker inner core. They are surrounded by a fuzzy, lighter-colored halo, likely representing the viral envelope and surface proteins. The background is a light blue, grainy texture.

Novel Coronaviruses

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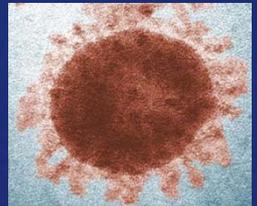
Emerging and Acute Infectious Disease Branch

Outline

- ⌘ What is a coronavirus
- ⌘ What is a novel coronavirus
- ⌘ SARS
- ⌘ MERS-CoV
- ⌘ Investigating novel coronaviruses

What is a coronavirus?

- ⌘ Enveloped positive strand RNA viruses
- ⌘ Common viruses that cause mild to moderate respiratory illness
 - ⌘ Symptoms may include runny nose, cough, sore throat, and fever. These viruses can sometimes cause lower-respiratory tract illnesses, such as pneumonia.
- ⌘ 6 human coronaviruses have been identified so far
 - ⌘ 4 “seasonal” coronaviruses
 - ⌘ SARS
 - ⌘ MERS-CoV
- ⌘ Also been found in pigs, cats, dogs, birds, rats, bats, etc.
- ⌘ No vaccine or specific antiviral treatment



What is a novel coronavirus?

⌘ A newly identified coronavirus causing infection in humans

⌘ Concerns:

- ⌘ Pandemic potential
- ⌘ Severity of illness
- ⌘ Economic impact

SARS

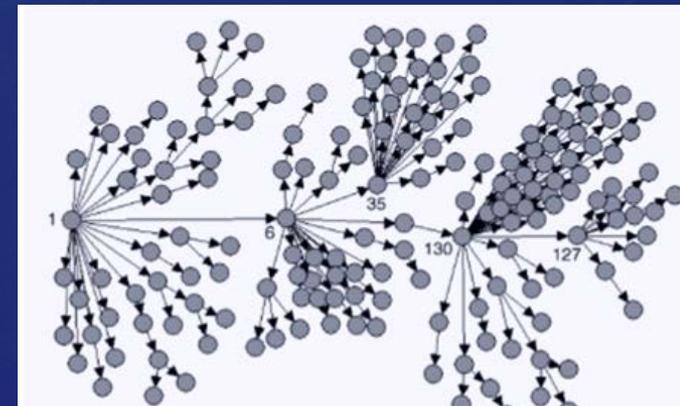
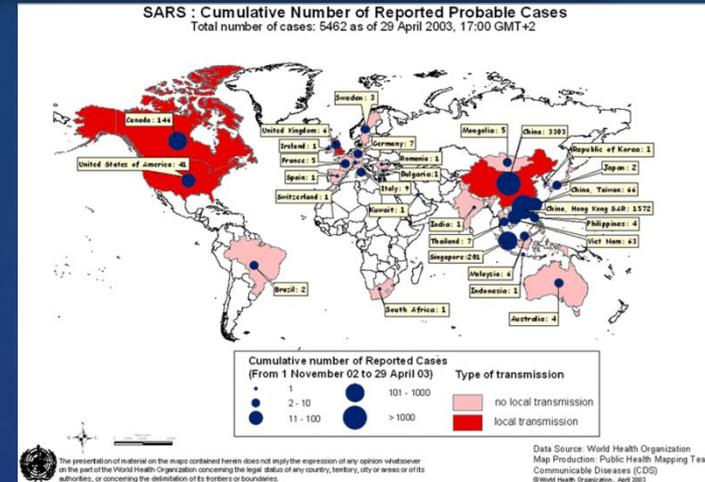
Severe Acute Respiratory Syndrome

November 2002 – July 2003

Originated in China; zoonotic origin

Worldwide there were 8,098 reported cases of SARS and 774 deaths in 26 countries

8 lab confirmed cases, 19 probable cases and 0 deaths in the United States



MERS-CoV

⌘ Middle Eastern Respiratory Syndrome Coronavirus

⌘ aka EMC-CoV or nCoV

⌘ First detected: April 2012

⌘ Total cases: 81

⌘ Total deaths: 45

⌘ Countries reporting cases: 8

MERS Cases and Deaths, April 2012 - Present

Current as of July 10, 2013, 9:00 AM EDT

Countries	Cases (Deaths)
France	2 (1)
Italy	3 (0)
Jordan	2 (2)
Qatar	2 (0)
Saudi Arabia	66 (38)
Tunisia	2 (1)
United Kingdom (UK)	3 (2)
United Arab Emirates (UAE)	1 (1)
Total	81 (45)

What is going on?

⌘ Origin / exposures

- ⌘ Appears limited to Middle Eastern countries
- ⌘ Unknown source
- ⌘ Possible zoonotic connection????

⌘ Human to human spread

- ⌘ Clear but limited human to human spread

⌘ 8 distinct clusters

- ⌘ Household/family/close contact clusters: SA, UK, Tunisia, Italy
- ⌘ Healthcare settings: Jordan, SA, France

⌘ Asymptomatic cases identified

- ⌘ Healthcare workers and children

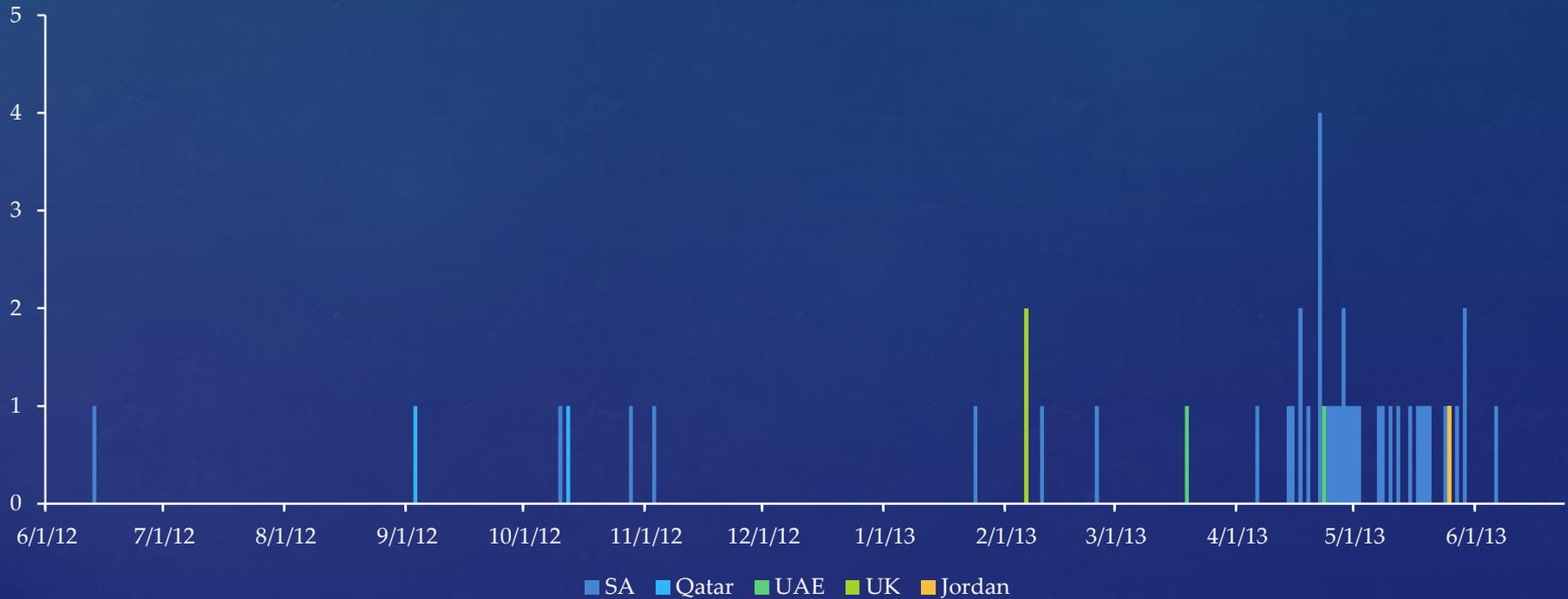


Overview of cases

- ‡ Median age: 51
- ‡ Age range: 14 months to 94 years
- ‡ 65% male
- ‡ Many severe cases have underlying conditions
- ‡ All cases have direct or indirect links to the Middle East
- ‡ Incubation period uncertain:
 - ‡ Median from one study = 5.2 days
 - ‡ Case definition = 14 days
- ‡ Higher viral load in lower respiratory tract specimens

EpiCurve

EpiCurve - MERS-CoV onsets reported publically (n=48)



Investigating reports



Case Definition

- ⌘ A Patient Under Investigation (PUI) is a person with-
 - ⌘ an acute respiratory infection, which may include fever ($\geq 38^{\circ}\text{C}$, 100.4°F) and cough; AND
 - ⌘ suspicion of pulmonary parenchymal disease (e.g., pneumonia or acute respiratory distress syndrome based on clinical or radiological evidence of consolidation); AND
 - ⌘ history of travel from the Arabian Peninsula or neighboring countries* within 14 days (or close contact with a symptomatic traveler); AND
 - ⌘ not already explained by any other infection or etiology, including all clinically indicated tests for community-acquired pneumonia according to local management guidelines.

- ⌘ Confirmed case:
 - ⌘ A person with laboratory confirmation of infection with MERS-CoV

Investigation Steps

- ⌘ Determine why MERS-CoV is suspected?
 - ⌘ Case definitions: www.cdc.gov/coronavirus/mers/case-def.html
 - ⌘ Cluster of severe acute respiratory illness among healthcare workers

- ⌘ If suspicion is warranted then continue investigation

- ⌘ Provide infection control guidance
 - ⌘ www.cdc.gov/coronavirus/mers/infection-prevention-control.html

- ⌘ Notify DSHS as soon as possible
 - ⌘ LHD → Regional office
 - ⌘ Regional office → EAIDB

- ⌘ Complete investigation short form
 - ⌘ www.cdc.gov/coronavirus/mers/interim-guidance.html#evaluation

Investigation Steps cont.

⌘ Be aware of any possible increases in ILI or SARI and investigate

⌘ Collect appropriate specimens and submit to DSHS for testing

⌘ Lower respiratory specimens preferred!!

⌘ Also collect stool, serum and NP / OP swabs

⌘ Collection guidance: www.cdc.gov/coronavirus/mers/interim-guidelines-mers-collection-processing-transport.html

⌘ Complete DSHS G-2A Lab Submission Form

⌘ Under Section 10. Virology, the "Other" box can be marked and please write in "NCV PCR"

⌘ Be prepared for the case to be confirmed

Section 10. VIROLOGY	
<input type="checkbox"/>	Electron microscopy
<input type="checkbox"/>	Influenza surveillance
	Vaccine received: <input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/>	Reference culture (Virus ID on isolate)
	Suspected: _____
	Submitted on: _____
<input type="checkbox"/>	Virus isolation (comprehensive)
	Suspected if any: _____
<input checked="" type="checkbox"/>	Other: <i>NCV PCR</i>

What happens if confirmed?

- ⌘ Expect intensive CDC and Media interest
- ⌘ Longer investigation form will be provided
- ⌘ Extensive follow up and testing of large numbers of contacts
 - ⌘ Actively monitor contacts for at least 14 days from last exposure
 - ⌘ Contacts include:
 - ⌘ Any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact.
 - ⌘ Any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill
 - ⌘ Ill contacts should be tested
 - ⌘ Non-ill contacts may have sera tested
 - ⌘ Initial sera collected as close to exposure as possible
 - ⌘ Second sera collected 3-4 weeks later

Example Contact Spreadsheet

Case ID	1	2	3	4	5	6	7
L_name	C	L	R	J	M	E	L
F_name	D	B	R	D	F	B	B
DOB	##\##\####	##\##\####	##\##\####	##\##\####	##\##\####	##\##\####	##\##\####
Gender	F	F	M	M	F	M	F
Case Status	Confirmed Case	Suspect Case	Contact	Contact	Contact	Contact	Contact
Contact of	n/a	1	1	1	1	2	2
Type of contact	n/a	Work	Work	Household	HCW	Household	Household
First Exposure	6/10/2013	6/25/2013	6/26/2013	6/26/2013	6/26/13	7/1/2013	7/1/2013
Last Exposure	6/21/2013	6/26/2013	6/26/2013	7/17/2013	6/26/13	7/17/2013	7/9/2013
Date of Onset	6/25/2013	7/1/2013	n/a	n/a	n/a	n/a	n/a
Date of lab confirmation	7/2/2013	Pending	n/a	n/a	n/a	n/a	n/a
Date Sera 1 collected	7/3/2013	7/3/2013	7/8/2013	7/8/2013	7/8/13	7/9/2013	7/9/2013
Date Sera 2 collected	TBC	TBC	TBC	TBC	TBC	TBC	TBC
Date of last follow up	n/a						
Exposure description and notes	traveled to Saudi Arabia 6/10-6/21 for work. Returned to work on 6/24. Started feeling bad 6/25 while at work. Worked ½ day on 6/26.	Share office space at work with case 1; case was symptomatic while at work for 1.5 days	Works on same floor as case; spent 30 minutes in the same room as the case	lives with case; no underlying conditions	Has asthma; Is a nurse and did not wear appropriate PPE for a patient who presented with acute febrile illness and cough	lives with case; no underlying conditions	lives with case; sent to stay with grandparents on 7/9

Want more information?

↳ WHO MERS-CoV website

- ↳ www.who.int/csr/disease/coronavirus_infections/en/
- ↳ Investigation guideline
- ↳ Case counts on Twitter

↳ CDC MERS-CoV website

- ↳ www.cdc.gov/coronavirus/mers/
- ↳ www.cdc.gov/coronavirus/mers/preparedness/

↳ CIDRAP

- ↳ www.cidrap.umn.edu/

↳ ProMed Mail

- ↳ www.promedmail.org/