5/29/2014

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Key Points – Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

Newly updated information is indicated in red

In this document:

Summary Key Messages

- The MERS situation in the U.S. represents a very low risk to the general public in this country.

- Our guidance and recommendations may change as the situation evolves and we learn more.

Second Imported Case of MERS in the U.S.

- A second imported case of Middle East Respiratory Syndrome (MERS) in the United States, identified in a traveler, was reported to CDC by the Florida Department of Health on May 11, 2014, and confirmed by CDC on May 11. The traveler is a healthcare provider who resides and works in Saudi Arabia. This case is unlinked to the first case of MERS in the U.S.
    - On May 1 the patient traveled by plane from Jeddah, Saudi Arabia to London, England; to Boston, Massachusetts; to Atlanta, Georgia; and to Orlando, Florida.
    - The patient began feeling unwell on May 1 during the flight from Jeddah, Saudi Arabia to London and continued to feel unwell on subsequent flights with reported symptoms including muscle aches, fever, chills, and a slight cough.
    - The patient continued to have intermittent fevers, nausea, and severe muscle aches while in Orlando.
    - On May 9 the patient went to the emergency department of a hospital in Florida and was admitted to that hospital the same day. The patient later tested positive for infection with MERS-CoV.
    - On May 18, health officials verified that the patient tested negative for active MERS-CoV infection, was no longer symptomatic, and posed no threat to the community; the patient was considered to be fully recovered and was discharged from the hospital.

- Public health and hospital officials are investigating and responding to the situation by:
    - Interviewing household contacts and healthcare staff who had close contact[2] with the patient to obtain detailed information on their exposures, collecting and testing specimens from them, and monitoring their health for relevant respiratory symptoms related to MERS-CoV infection.
    - Identifying other people who had close contact[2] with the patient, and
        - interviewing them
        - monitoring them to see if they become ill
        - collecting and testing specimens from them, if needed
        - requesting that they monitor their health and seek care if they develop symptoms.
    - On May 15, the Florida Department of Health and Dr. P. Phillips Hospital announced that all healthcare workers who had contact with the patient were tested for MERS-CoV, and all of the results came back negative. On May 19 they announced that all household contacts had also tested negative.

- CDC is conducting airline contact tracing to identify and notify U.S. travelers who may have been exposed to the infected traveler.
    - CDC will also provide information to international partners about any non-U.S. citizens who are identified through contact tracing.

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- CDC is conducting these contact investigations to
    - Refer any contacts, such as fellow passengers or crew, who are identified with fever or signs of respiratory illness, for medical evaluation, laboratory testing, and medical care, as needed.
    - Provide information to exposed passengers and crew so they can recognize any symptoms of illness, then isolate themselves, if needed, and seek medical care.
    - Determine whether MERS-CoV may have spread on the flights and which passengers were at risk.

- To date, CDC, state and local public health partners, and ministries of health have contacted almost all of the people who were on the flights with the second U.S. case. CDC and state and local public health continue to do follow-up interviews with the people who were on these flights. At this time, none of the contacts on the flights have had evidence of being infected with MERS-CoV.

First Imported Case of MERS in the U.S.

- The first case of MERS in the United States, identified in a traveler, was reported May 1, 2014, to CDC by the Indiana State Department of Health (ISDH) and confirmed by CDC on May 2. The traveler was a U.S. citizen who lived and worked as a healthcare provider in Saudi Arabia at a hospital in which MERS patients had received care.
    - On or around April 18, the traveler began feeling unwell and developed a low-grade fever while still in Saudi Arabia.
    - On April 24, the traveler departed Riyadh, Saudi Arabia and traveled by plane to London, England, then from London to Chicago, Illinois. The traveler then took a bus from Chicago to Indiana.
    - On April 27, the traveler experienced increasing fever and developed respiratory symptoms including runny nose, coughing and shortness of breath.
    - On April 28, the traveler went to an emergency department of a hospital in Indiana, and was admitted to that hospital on the same day. The patient later tested positive for infection with MERS-CoV.
    - On May 9, health officials verified that the patient tested negative for active MERS-CoV infection, was no longer symptomatic, and posed no threat to the community; the patient was considered to be fully recovered and was discharged from the hospital.

- Public health and hospital officials rapidly investigated and responded to the situation:
    - Monitored the health of the family members and healthcare staff who had close contact[2] with the patient, and collected and tested specimens from them.
    - Household contacts and hospital staff who had unprotected close contact[2] with the patient remained in temporary voluntary home quarantine for 14 days after contact, the period in which MERS symptoms would be expected to appear. (Quarantine is used to separate and restrict the movement of well persons who may have been exposed to a communicable disease to see if they become ill.)
    - Hospital staff who were asymptomatic returned to work following 14 days after the last exposure and confirmed negative lab results for MERS-CoV.

- CDC shared contact information of passengers on the airplane with the U.S. imported case with state and local health departments in the areas where the travelers live or are staying.
    - A number of state health departments have helped CDC locate exposed passengers and determine whether they have symptoms and need to be tested and receive medical care for MERS-CoV infection.
    - Public Health England is conducting a contact investigation for the flight from Saudi Arabia to England.
        - U.S. residents who were on that flight were contacted by CDC.

- To date, CDC and state and local public health partners have contacted and interviewed almost all of the people who were on the airplane and bus with the first U.S. case. At this time, none of the contacts on the airplane or bus have had evidence of being infected with MERS-CoV.

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Updates on Ongoing Investigations of Contacts

- CDC and state and local public health officials continue to conduct voluntary testing of people who had contact with the two MERS patients who had traveled from Saudi Arabia to the United States - one person in Indiana, the other in Florida.
    - To date, public health and hospital officials have monitored the health of the family members and healthcare staff that had close contact with the two U.S. patients with MERS, and collected and tested specimens from them.
    - CDC has also contacted almost all of the people who were on the flights with the two travelers and on the bus with the first traveler. CDC continues to do follow-up interviews and voluntary testing with them.

- As part of these ongoing investigations, State and CDC labs are conducting two kinds of laboratory tests to identify MERS-CoV infection.
    - One type of tests conducted by state and CDC labs, are called PCR, or polymerase chain reaction, assays.
        - PCR tests are done with respiratory samples and can quickly indicate if a person has active infection with the MERS virus
    - A second type of testing used by CDC's labs is called serology testing.
        - Serology testing uses blood samples and is designed to look for antibodies to MERS-CoV that would indicate if a person had been previously infected with the virus and developed an immune response.
        - Serology for MERS-CoV includes three separate tests – (1) ELISA or enzyme-linked immunosorbent assay, (2) IFA or Immunofluorescent assay, and a third more definitive test called the neutralizing antibody assay. The neutralizing antibody test takes longer than the other two tests.

- On April 25, 2014, an Illinois resident had extended face-to-face contact during a business meeting with the first case of confirmed MERS in the U.S., shortly before the case was hospitalized in Indiana.
    - Health officials identified this person as part of the contact investigation and had been monitoring his health daily since May 3.
    - He initially tested negative for active MERS-CoV infection by PCR in the days after his interaction with the confirmed MERS patient.

- Given the Illinois resident's contact with the MERS patient, CDC chose to conduct serology testing to see if the Illinois resident had antibodies to MERS-CoV.
    - The initial, preliminary ELISA and IFA results indicated the possibility that the Illinois resident had been previously infected with MERS-CoV.

- Based on these results, CDC notified and tested the people with whom the Illinois resident had close contact in the days following his interaction with the Indiana MERS patient to be sure that no one else had become ill and to prevent any possible further spread of the virus.

  After completing an additional slower, but more definitive laboratory test – the neutralizing antibody test – CDC has concluded that the Illinois resident was not previously infected with MERS-CoV.

- Public health officials have informed the Illinois resident of the additional serology test results and the final conclusions.

- To date, active MERS-CoV infection has not been found in any of the contacts of the two people in the United States confirmed to have the disease. However, investigations, including voluntary serology testing of contacts, are ongoing and the situation could change.

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- CDC is committed to communicating openly about MERS with our domestic and international partners, the media, and the general public with the understanding that this situation is very fluid and information may change as we learn more about the virus.

- CDC works hard to avoid undue concern among those who have had contact with a patient with MERS, though it is the job of CDC to move quickly when there is a public health concern.

- Because there is still so much we don't know about this virus, CDC will continue to err on the side of caution when responding to and investigating cases of MERS in the United States.

MERS Cases and Deaths Worldwide (WHO)

- As of May 28, 2014, a total of 636 laboratory-confirmed cases, including 193 deaths due to MERS-CoV infection have been reported.
    - Reported illness onsets were between April 2012 and May 2014.
    - Since mid-March 2014, the frequency with which cases have been reported has increased. The frequency with which travel-associated cases have been reported, and the number of countries reporting them, have also increased. Public health investigations are ongoing to determine the reason for the increase in cases.

Countries in or near the Arabian Peninsula[1] with cases:

- Saudi Arabia
- United Arab Emirates (UAE)
- Qatar
- Oman
- Jordan
- Kuwait
- Yemen
- Lebanon

Countries with travel-associated cases:

- United Kingdom (UK)
- France
- Tunisia
- Italy
- Malaysia
- Philippines
- Greece
- Egypt
- United States of America (USA)
- Netherlands

Two patients were transferred to Germany for care.

What CDC and Our Partners are Doing

What CDC is doing to prepare for MERS importations to the United States

- CDC continues to closely monitor the MERS situation globally and work with the World Health Organization and other partners to understand the risks of this virus to the public's health. We recognize the potential for MERS-CoV to spread further and cause more cases globally and in the United States. In preparation for this, we have
    - Enhanced surveillance and laboratory testing capacity in states to detect cases
    - Developed guidance and tools for health departments to conduct public health investigations
    - Provided recommendations for healthcare infection control and other measures to prevent disease spread

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- Disseminated up-to-date information to the general public, international travelers, and public health partners.

- CDC continues to do surveillance by working with our partners at U.S. ports of entry, including Customs and Border Protection, airlines, and Emergency Medical Service units at airports.
  - CDC has developed guidance to educate partners on the symptoms to watch out for and how to report illnesses to CDC's quarantine station staff.
    - CDC is reaching out to these partners to remind them about what to look for and report to CDC.
  - Together with partners at ports of entry, CDC staff continue to assess ill travelers returning from affected areas who have been reported to CDC.
    - The assessment helps determine whether the ill travelers are at risk for MERS-CoV infection and whether any additional public health actions are needed, such as a referral to a healthcare provider or public health department for evaluation and testing.

- CDC is also educating travelers to take precautions while traveling and monitor their own health after returning from countries in or near the Arabian Peninsula[1].
  - Information about MERS for travelers is displayed in airports on electronic monitors and posters, and is available on the CDC website and through social media.
  - Informational cards are provided to ill travelers, which recommend that they monitor their symptoms, call a doctor to make an appointment, and take steps to protect others from infection.

What CDC is doing to help the scientific community

- In 2013, CDC developed and validated diagnostics tests to detect MERS-CoV in clinical samples. Testing kits have been distributed to 44 labs under Emergency Use Authorization, and all have passed proficiency testing. The Emergency Use Authorization was recently expanded to allow use for testing of asymptomatic contacts. The kits also have been provided to laboratories in 41 countries.

- CDC has developed four different serological assays for detecting antibodies to MERS-CoV that would indicate a person had previously been infected with MERS-CoV.

- CDC has obtained the partial MERS-CoV genomic sequences from a MERS case in Greece, in collaboration with the Hellenic Center for Disease Control and Prevention and the Hellenic Pasteur Institute in Greece, as well as the complete genomic sequences from the case in Indiana, in collaboration with the Indiana State Department of Health and Community Hospital, and the case in Florida, in collaboration with the Florida Department of Health and Dr. P. Phillips Hospital.
  - Comparison of these new sequences with other publically available virus sequences does not indicate any significant changes that would explain the current increase in reported cases.
  - CDC and these institutions submitted the sequences to GenBank to make them available to the scientific community for further testing and analysis.

- As part of the investigations of the two U.S. cases, CDC is collecting blood samples from exposed contacts who are willing to voluntarily provide them. The blood sample testing can help CDC learn about how MERS-CoV spreads. Test results will help us determine who could have been infected with MERS-CoV even if they did not have symptoms.

CDC's International Collaborations

- CDC is collaborating with the Ministry of Health in the Kingdom of Saudi Arabia (KSA) to address shared public health concerns about MERS-CoV.
  - In May 2014, the KSA Ministry of Health invited CDC to collaborate on investigations of MERS-CoV in the Kingdom. A team of CDC experts went to KSA under the auspices of the World Health Organization (WHO).
  - The KSA Ministry of Health is leading the investigation. Any questions should be directed to the KSA Ministry of Health.

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- These collaborations are going well and there are ongoing discussions about how CDC and the KSA Ministry of Health can continue to work together.

- In May 2013, CDC scientists joined the Jordan Ministry of Health and regional partners to investigate a past outbreak of severe respiratory illness that occurred in Zarqa Governorate Hospital in April 2012.
  - Two people in this outbreak were previously confirmed as having MERS-CoV infection; both died.
  - As a result of the investigation, seven additional people were identified to have antibodies to MERS-CoV, indicating previous infection.
    - WHO does not count people identified with evidence of past MERS-CoV infection to be cases. WHO has not included these people in the total case count.
  - Any questions about the MERS cluster investigation should be directed to the Jordan Ministry of Health.

- In October 2012, a CDC team went to Saudi Arabia to learn more about MERS-CoV.

What our partners are doing

- The World Health Organization (WHO) Emergency Committee met and decided on May 13, 2014, that MERS has not yet met the criteria to be declared a Public Health Emergency of International Concern. However, the committee expressed significant concern about increases in cases, infection-control practices in hospitals, and international spread and provided recommendations to all countries to reduce the spread of MERS-CoV. See http://www.who.int/mediacentre/news/statements/2014/mers-20140514/en/
  - Most of the recommended steps are actions that U.S. public health agencies and hospitals routinely take.

- The U.S. National Institutes of Health (NIH) is sponsoring ongoing studies to develop better small animal models in transgenic mice and rabbits and nonhuman primates such as marmosets and macaques at the NIH's Rocky Mountain Laboratory.

- NIH and NIH-supported laboratories are screening compounds in tissue-culture assays and several transgenic mice models.

- NIH and industry are supporting early development of drugs to treat MERS-CoV infection, including small molecule inhibitors, monoclonal antibodies, and other molecules.

- NIH'S Rocky Mountain Laboratory also is testing several drugs that are approved or were being tested for other illnesses. For example, the lab is testing nitazoxanide, an approved anti-parasitic drug, which is in Phase 3 studies as an antiviral drug for influenza.

CDC Recommendations and Guidelines

What the general public should do to protect themselves

- CDC routinely advises that people help protect themselves from respiratory illnesses by taking everyday preventive actions like washing their hands often; avoiding touching their face with unwashed hands; avoiding close contact with people who appear sick; and cleaning frequently touched surfaces.

What people preparing to travel should do

- At this time, CDC does not recommend that anyone change their travel plans.

- If you are traveling to countries in or near the Arabian Peninsula[1], CDC recommends that you pay attention to your health during and after your trip.

- CDC recommends that travelers stay informed by visiting www.cdc.gov/travel and following @CDCtravel for updates and the latest advice.

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- The travel notice for MERS-CoV was upgraded to a level 2 alert. The travel notice advises people traveling to the Arabian Peninsula[1] for health care work to follow CDC's recommendations for infection control, and other travelers to the Arabian Peninsula to take general steps to protect their health.
- All travelers to the Arabian Peninsula[1] should practice general hygiene measures, including:
  - Regular handwashing before and after touching animals
  - Avoid contact with sick animals
  - Avoid consumption of raw or undercooked animal products.
- The World Health Organization (WHO) considers certain groups to be at high risk for severe MERS, including people with diabetes, kidney failure, chronic lung disease, or those with weakened immune systems. These groups should take additional precautions:
  - Avoid contact with camels
  - Do not drink raw camel milk or raw camel urine
  - Do not eat undercooked meat particularly camel meat
- For more information, see WHO's recommendations on page 8 at: http://www.who.int/csr/disease/coronavirus_infections/MERS_CoV_Update_09_May_2014.pdf%20.

What recent travelers from the Arabian Peninsula should do

- If you develop a fever and symptoms of respiratory illness, such as cough or shortness of breath, within 14 days after traveling from countries in or near the Arabian Peninsula[1], you should call ahead to a healthcare provider and mention your recent travel. While sick, stay home from work or school and delay future travel to reduce the possibility of spreading illness to others.

What close contacts[2] of an ill traveler from the Arabian Peninsula should do

- If you have had close contact[2] with someone who recently traveled from a country in or near the Arabian Peninsula, and the traveler has/had fever and symptoms of respiratory illness, such as cough or shortness of breath, you should monitor your health for 14 days, starting from the day you were last exposed to the ill person.

- If you develop fever and symptoms of respiratory illness, such as cough or shortness of breath, you should call ahead to a healthcare provider and mention your recent contact with the traveler. While sick, stay home from work or school and delay future travel to reduce the possibility of spreading illness to others.

What people who have had close contact[2] with a confirmed or probable case should do

- If you have had close contact[2] with someone who has a probable or confirmed MERS-CoV infection, you should contact a healthcare provider for an evaluation. Your healthcare provider may request laboratory testing and outline additional recommendations, depending on the findings of your evaluation and whether you have symptoms. You most likely will be asked to monitor your health for 14 days, starting from the day you were last exposed to the ill person. Watch for these symptoms:
  - Fever (100° Fahrenheit or higher). Take your temperature twice a day.
  - Coughing
  - Shortness of breath
  - Other early symptoms to watch for are chills, body aches, sore throat, headache, diarrhea, nausea/vomiting, and runny nose.

- If you develop symptoms, call your healthcare provider as soon as possible. Before your medical appointment, call the healthcare provider and tell him or her about your possible exposure to MERS-CoV. This will help the healthcare provider's office take steps to keep other people from getting infected. Ask your healthcare provider to call the local or state health department.

What healthcare professionals should do

- Healthcare professionals should follow CDC infection control recommendations and wear appropriate personal protective equipment when evaluating patients for MERS-CoV infection. They should evaluate patients for MERS-CoV infection who:
  a. have fever and pneumonia or acute respiratory distress syndrome (ARDS), and either

i. a history of travel from countries in or near the Arabian Peninsula within 14 days before symptom onset, or
ii. have had close contact[2] with a symptomatic traveler who developed fever and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula, or
iii. are part of a cluster of patients with severe acute respiratory illness of unknown etiology in which MERS-CoV is being evaluated.

b. have had close contact with a confirmed or probable case of MERS while the person was ill, in consultation with state and local health departments.

- Patients with lower respiratory illness should also be evaluated for common causes of community-acquired pneumonia[3], guided by clinical presentation and epidemiologic and surveillance information. For these patients, testing for MERS-CoV and other respiratory pathogens can be done simultaneously. Positive results for another respiratory pathogen (e.g. influenza) should not necessarily preclude testing for MERS-CoV because co-infection can occur.

- Healthcare professionals should immediately report to their state or local health department any person being evaluated for MERS-CoV infection as a patient under investigation (PUI), who will then report this information to CDC. Data collection forms are available at www.cdc.gov/coronavirus/mers/data-collection.

- Additional information, including criteria for PUI are at http://www.cdc.gov/coronavirus/mers/interim-guidance.html. Healthcare providers should contact their state or local health department if they have any questions.

- For suspected MERS cases, healthcare providers should collect the following specimens for submission to CDC or the appropriate state public health laboratory:
  - nasopharyngeal swab,
  - oropharyngeal swab (which can be placed in the same tube of viral transport medium),
  - sputum, serum, and
  - stool/rectal swab.
  - Specimens can be sent using category B shipping containers. Additional information is available at http://www.cdc.gov/coronavirus/mers/guidelines-clinical-specimens.html.

- Healthcare providers should adhere to recommended infection control measures, including standard, contact, and airborne precautions, while managing symptomatic close contacts[2], patients under investigation, and patients who have probable or confirmed MERS-CoV infections. Recommended infection control precautions should also be utilized when collecting specimens.
  - Any patient seeking care for symptoms consistent with MERS-CoV infection should be immediately placed in a private room with the door closed until an isolation room can be arranged.
  - Evaluation and care of the patient should be performed using standard, contact, and airborne precautions while awaiting confirmation of diagnosis.
  - Place a facemask on the patient whenever the patient is outside of the isolation room.
  - Healthcare personnel should use eye protection in addition to disposable gowns, gloves, and respiratory protection when entering the isolation room.
  - Patient care equipment, such as stethoscopes and blood pressure cuffs, should be dedicated to the isolation room and not moved from room to room.
  - The patient care environment should be cleaned using an Environmental Protection Agency-registered hospital disinfectant, applied according to label instructions, with attention to toilets and frequently touched surfaces.
  - See Interim Infection Prevention and Control Recommendations for Hospitalized Patients with MERS-CoV for more information: http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html.

- People who had close contact[2] with a confirmed or probable case of MERS while the case was ill, if not using recommended infection control precautions (e.g. appropriate use of personal protective equipment),

are at increased risk of developing MERS-CoV infection and should be evaluated and monitored by healthcare professionals with a higher index of suspicion. See Interim Guidance for Health Professionals for more information: www.cdc.gov/coronavirus/mers/interim-guidance.

- Healthcare providers and facilities can take key actions now to enhance preparedness for MERS-CoV infection control. See: www.cdc.gov/coronavirus/mers/preparedness.

- Health departments should contact CDC's Emergency Operation Center (770-488-7100) if they have questions.

- Additional or modified recommendations may be forthcoming as the investigation proceeds.

Background, MERS and MERS-CoV

- Middle East Respiratory Syndrome (MERS) is the illness caused by Middle East Respiratory Syndrome Coronavirus (MERS-CoV).

- MERS-CoV is different from other coronaviruses that have been found to infect people.
  - MERS-CoV is not the same coronavirus that caused SARS in 2003. However, like SARS, MERS-CoV has caused severe acute respiratory illness and pneumonia in many reported cases.

- We don't know where the virus came from or exactly how it spreads.
  - Scientists are investigating clusters of MERS in countries in and near the Arabian Peninsula[1] to learn how the initially infected people (index cases) were exposed to the virus.
  - Studies have been done to test animals, including camels, for evidence of MERS-CoV infection.
    - One recent study showed that MERS-CoV gene sequences detected in samples from camels in Saudi Arabia were similar to MERS-CoV gene sequences detected in samples from infected humans.
    - Another study detected evidence of MERS-CoV (gene sequences) in three out of 14 camels on a farm, linked to two confirmed human infections from Qatar.
    - MERS-CoV gene sequences have also been identified from camels in Saudi Arabia and Egypt, some associated with human cases.
    - Other studies have shown that camels from several countries, including Egypt, Oman, and Spain, had antibodies to MERS-CoV. This indicates that they had previous exposure to MERS-CoV or another closely related virus.
    - Together these studies provide further evidence that camel infections may play a role in human infection with MERS-CoV.
    - Another study identified limited MERS-CoV gene sequence from a bat in Saudi Arabia.
    - More information is needed to define the role that camels, bats, and other animals may play in possible transmission of MERS-CoV.

Symptoms

- Most people confirmed to have MERS-CoV infection have had severe acute respiratory illness.
  - Symptoms included fever, cough, and shortness of breath.
  - Many of them had pneumonia.
  - Some people also had gastrointestinal symptoms, including diarrhea.
  - Some have had kidney failure.
  - About 30% of them died.

- Some people did not have any symptoms, or had only mild respiratory illness; they recovered.

Risks

- Based on the information we have so far, people with pre-existing health conditions (comorbidities) or weakened immune systems may be more likely to become infected with, or have a severe case of, MERS.
  - Most of the people who died from MERS had at least one comorbidity.

- Comorbidities from reported cases for which we have information have included diabetes; cancer; and chronic lung, heart, and kidney disease.

Transmission

- In other countries affected by MERS:
  - Limited human-to-human spread has been reported, usually after close and prolonged contact, such as caring for or living with an infected person.
  - There is no definitive evidence of sustained spreading in community settings.
  - Infected people have spread MERS-CoV to others in healthcare settings. This has happened in hospitals in Saudi Arabia, France, Jordan, UAE, and Qatar.
  - Clusters of human-to-human spread have been seen most frequently in healthcare workers caring for MERS patients. A cluster is defined as two or more persons with onset of symptoms within the same 14-day period, and who are associated with a specific setting such as a classroom, workplace, household, extended family, hospital, other residential institution, military barracks, or recreational camp.

- Most people who had close contact[2] with people who had MERS-CoV infection did not get infected or ill.
  - This information is based on public health investigations of cases in Jordan, Saudi Arabia, the United Kingdom (UK), France, and Germany.
  - To better understand the risk for infection, we need additional information about the extent of exposures to infected people, frequency of community and household contacts, and contacts before and during illness.
  - We are working with our partners to carefully evaluate the cases of MERS in the U.S. Through this public health investigation, we hope to gain a better understanding of the virus, risk of transmission, and the spectrum of illness it causes.

- All reported cases have been directly or indirectly linked through travel or residence to countries in or near the Arabian Peninsula[1].
  - Most infected people either lived in the Arabian Peninsula or recently traveled from the Arabian Peninsula before they became ill.
  - A few people became infected with MERS-CoV after having close contact[2] with an infected person who had recently traveled from the Arabian Peninsula.

- Public health agencies continue to investigate clusters of cases in several countries to better understand how MERS-CoV spreads from person to person.

Vaccine and Treatment

- There is no vaccine to prevent MERS-CoV infection at the present time.

- There is no specific antiviral treatment recommended for MERS-CoV infection; medical care can help relieve symptoms. For severe cases, current treatment includes care to support vital organ functions.

- There is a need for more reliable and qualified animal models to test effectiveness of existing and new potential drugs to treat MERS-CoV.

- The U.S. National Institutes of Health (NIH) is establishing an interagency MERS-CoV medical countermeasures working group to map the landscape all of the coronavirus medical countermeasures in development, as well as the non-clinical, clinical, and regulatory pathways and challenges, and the ability to manufacture medications or vaccines for clinical studies and commercial use.
  - NIH has the lead in exploring possibilities for a MERS-CoV vaccine.
  - NIH and, to a lesser extent, industry are supporting very early development of several vaccine approaches for MERS-CoV vaccines, including DNA vaccines, recombinant proteins such as virus-like particles, peptides, inactivated and live, attenuated vaccines, and virus vectors.
  - NIH has supported and conducted foundational work on potential SARS vaccines; this work may be helpful for developing a MERS-CoV vaccine.

- CDC believes that a vaccine could be a useful tool to prevent transmission, especially in a healthcare setting.

- The FDA has not approved specific antiviral treatment for people with MERS-CoV infection. Also, CDC, NIH, FDA, and WHO do not currently have recommendations for specific antiviral treatment.

Where people get more information about MERS

- CDC will continue to post new information about MERS on the following websites as it becomes available:
  - CDC MERS website: www.cdc.gov/coronavirus/mers
  - Travelers' Health: http://wwwnc.cdc.gov/travel/notices/alert/coronavirus-arabian-peninsula-uk

- WHO coronavirus infections website: www.who.int/csr/disease/coronavirus_infections/en

- Indiana State Department of Health: http://www.in.gov/isdh/25796.htm

- Florida Department of Health: http://newsroom.doh.state.fl.us/2014/05/12/mers-cov-2/

[1] Countries in or near the Arabian Peninsula include: Bahrain; Iran; Iraq; Israel, the West Bank, and Gaza; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; Syria; the United Arab Emirates (UAE); and Yemen.

[2] Close contact is defined as: a) any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact; or b) any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill.

[3] Examples of respiratory pathogens causing community-acquired pneumonia include influenza A and B, respiratory syncytial virus, *Streptococcus pneumoniae*, and *Legionella pneumophila*.