ViPR Comprehensive Middle East Respiratory Syndrome Coronavirus (MERS CoV) Digest

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MERS CoV HISTORY

- **Brief History**: Lancet ID News Article and a lay language summary (blog)
  - **MERS CoV Description and Origin**
    - **NIAID Director, Dr. Tony Fauci** – radio interview on MERS Radio interview
    - May 2013: MERS CoV named by Intl. Coronavirus study group Article, WHO
    - Belongs to lineage C of Betacoronavirus genus (Coronavirinae subfamily) along with viruses found in bats in EU and China, HKU4 and HKU5 bat viruses (1 of 6 coronaviruses identified, incl. SARS)
    - Source of infection and mode of transmission unknown (incubation period max 14 days)
    - Evidence of person-to-person and nosocomial transmission (short transmission chains)
    - ~ 50% mortality rate among known cases
  - **1st Cases**: CDC timeline cases; 1st reported in SA, but appeared 1st in Jordan Apr. ’12 Article, Promed, WHO
    - 1st: 60 y/o male in SA (died, severe pneumonia/renal failure, June ’12 NEJM, Article1
    - 2nd: 49 y/o male in Qatar with similar symptoms in Sept ’12 WHO, Eurosurveillance Article
    - 1st family cluster: 3rd-6th cases from SA and Qatar Nov’ 12 WHO, NEJM Article2
    - UK family cluster, Feb ’13 Eurosurveillance Article
    - Healthcare facility clusters in SA and France in Apr-May ’13 (see Lancet ID article below)
  - **Geographic Spread**
    - **Middle East (ME)**: SA, Qatar, Jordan, UAE,
    - **N. Africa**: Tunisia
    - **Europe**: France, Germany, UK, and Italy (index cases linked to ME)
  - **Major Unknown**: What will happen when millions of pilgrims travel to the Hajj in SA?

MERS CoV HIGHLIGHTS

- **MERS transmission speculated as life returns to normal in SA**: News1, News2
  - In hospitals and maybe among close contacts Lancet ID, NEJM, Jordan outbreak, ECDC
  - Could religion and culture mediate our response to inf. diseases like MERS in men? Disc. Mag., News1, News2
  - Total of 20 asymptomatic cases draws questions about silent transmission SA MOH Press Release, CIDRAP
  - German researchers explore role of camels/goats as MERS case died after caring for sick camel News

- **Is MERS the next SARS?**
  - Yes, it is
    - Researchers use deep sequencing and clinical monitoring to track MERS in hospital outbreak.
    - Hospitals and superspreaders important for MERS transmission, similar to SARS NEJM Article3, Press Release, News1, News2, News3, News4
  - No, it isn’t
    - Researchers analyze virologic, clinical features of a MERS case and find less viral shedding than SARS Lancet ID Article, News
    - Researchers identify major differences in host response to MERS (Article), and MERS induces more genetic changes than SARS
    - Age/gender differences: MERS: older males with preexisting conditions while SARS more prominent in females, younger people w/o comorbidities
- Source of MERS -- bats?
  - Genetic similarity between MERS and a 2008 bat corona virus [Lancet ID Article, News]
  - Research reveals that MERS can infect bat cells, but SARS cannot [Article, Comment]
  - J Virol: Genetic characterization of Beta coronavirus lineage C viruses in bats [Article, Comment]
  - EID: Human Beta coronavirus 2c EMC/2012-related viruses in bats, Ghana and Europe: 15-25% of tested bats carry MERS CoV (Note: MERS was first called novel human beta coronavirus) [Article]
  - JGV: Coronaviruses in bats from Mexico [Article]
  - ViPR analysis of MERS-CoV sequences. ViPR scientists have carried out an analysis of available MERS-CoV sequences, using data and tools available at ViPR. [Analysis]
  
### MERS CoV REPORTS/COMMUNICATIONS

- ECDC's 5th and latest MERS Risk assessment as of June 18 [Report]
- CDC's webcast - MERS-CoV: Information and Guidance for Clinicians [Watch or listen Slides]
- UK Health Protection Agency publishes MERS CoV whole genomes [Announcement with sequence download]
- Eastern Med. Health Journal Special Issue on MERS CoV [Journal]
- WHO
  - Updated Interim surveillance recommendations for human infection with MERS [Report]
    - Highlights need for lower respiratory tract specimens for diagnosis, rather than NP swabs
    - Longer observation period of contacts as incubation period is up to 14 days
  - Press statement about MERS CoV [Release Presentation]
  - Joint WHO and SA mission in Riyadh documents epi. patterns and important points [Release]
  - Pbl. health officials met in Cairo; agree on priority actions list for MERS [Release Meeting conclusions News]
  - Revised MERS CoV case definition [WHO Update]
  - Updated guidance on travel recommendations [WHO Update]

### MERS CoV LATEST HUMAN CASES

**Human Cases: Official Laboratory Confirmed WHO Count as of 06-26-13: 77 Cases, 40 Deaths; CFR: 52%**

**WHO latest summary update June 20** and table tracking cases/deaths up to **June 24**

Note: Unless labeled “suspected”, all cases confirmed/accepted by WHO.

**CASES/DEATHS:** WHO's latest updates, Saudi MOH Media Statements, Table of Cases (Wiki)

#### Latest Cases
- 6 asymptomatic cases identified among close contacts in Riyadh and E. SA
- Riyadh: 41yr female (contact with confirmed case) and 63yr woman w underlying medical conditions
- E. SA: 50yr female (hospitalized, stable), 43yr female (recovered) and 43yr male w underlying medical conditions
- 3 female healthcare workers, 2 asymptomatic (29, 39, and 45 yrs) from Makkah Region who cared for MERS cases detected as part of outbreak investigation/contact tracing.
- Jeddah: 2 yr. child with underlying medical conditions
- Taif Governate: 45 yr. and 68 yr. males from with underlying medical conditions, both in critical condition

#### Latest Deaths:
- 32yr. male from E. SA, 81 yr. male, 46 yr. male from Wadi Al-Dawaser (ill at the end of May, died on June 8)
**MERS CoV Vaccines/Diagnostics and Antivirals**

- Synthetic MERS CoV vaccine delivered in adenovirus is produced in just one month by GreffexNews
- Who owns the rights to the first MERS strain? Holland? Material Transfer Agreement Info NatureNews

**MERS CoV Pandemic Preparedness**

- US President’s Executive office releases National Biosurveillance S&T Roadmap Report
- Saudi pilgrims to be reduced by 1/5th according to Saudi officials. Speculation the move is to control MERS News
- Pandemic potential of MERS CoV explored News
- US tests 30 suspected patients for MERS CoV News
- Lancet: MERS: new disease, old lessons Article; pandemic averted by clinician’s actions?

**Select Literature and Additional Reports**

- **ASM**
  - Cell Host Response to Infection with Novel Human Coronavirus EMC Predicts Potential Antivirals and Important Differences with SARS Coronavirus Article
  - Human Coronavirus EMC Does Not Require the SARS-Coronavirus Receptor and Maintains Broad Replicative Capability in Mammalian Cell Lines Article
  - Genomic Characterization of a Newly Discovered Coronavirus Associated with ARDS in Humans Article
- **CID:** Lack of nasal carriage of novel HCoV-EMC in French Hajj pilgrims 2012, despite a high rate of respiratory symptoms Article
- **EID:** Human Betacoronavirus 2c EMC/2012–related Viruses in Bats, Ghana and Europe Article
- **EMHJ:** Novel coronavirus infections in Jordan, April 2012: epidemiological findings from a retrospective investigation Article
- **Eurosurveillance**
  - Severe respiratory illness caused by a novel coronavirus, in a patient transferred to the UK from the Middle East, Sept’12 Article
  - Evidence of person-to-person transmission within family cluster of novel coronavirus infections, UK, Feb’13 Article
  - Contact investigation of a case of human novel coronavirus infection treated in a German hospital, Oct-Nov’12 Article
  - First cases of MERS-CoV in France, investigations/implications for prevention of H-2-H transmission, May’13 Article
  - Transmission scenarios for MERS-CoV and how to tell them apart Article
  - Novel coronavirus associated with severe respiratory disease: case definition and public health measures Article
- **JGV:** Coronaviruses in bats from Mexico Article
- **J Infection:** Cross-reactive Ab in convalescent SARS patients’ sera against the emerging novel human coronavirus EMC (2012) by both immunofluorescent and neutralizing Ab tests Article
- **J Virol:** Genetic characterization of Betacoronavirus lineage C viruses in bats revealed marked sequence divergence in the spike protein of Pipistrellus bat coronavirus HKU5 in Japanese pipistrelle: implications on the origin of the novel MERS Coronavirus Pubmed
- **JVI**
  - Receptor binding domain of MERS coronavirus maps to 231-residue region in spike protein that elicits neutralizing Ab Article
  - Naming MERS-CoV; Announcement of the Coronavirus Study Group Article
- **Lancet**
  - MERS: new disease, old lessons Article
- **Lancet ID**
  - Clinical features and viral diagnosis of two cases of infection with MERS: a report of nosocomial transmission Article
  - Clinical features and virological analysis of a case of Middle East respiratory syndrome coronavirus infection Article
  - Applying lessons from SARS to a newly identified coronavirus Article
- **MMWR:** Update: Severe Respiratory Illness Associated with MERS-CoV — Worldwide, 2012–2013 Article
- **NEJM**
  - Isolation of a Novel Coronavirus from a Man with Pneumonia in Saudi Arabia Article
  - Family Cluster of MERS Infections Article
  - Hospital Outbreak of MERS Coronavirus Article
- **Virol J:** A novel coronavirus capable of lethal human infections: an emerging picture Article

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