MERS-CoV: coming to a hospital near you?

Infection prevention and control challenges

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MERS-CoV: introduction

- A novel coronavirus emerged several years ago in the Middle East, called the “Middle East Respiratory Syndrome Coronavirus” (MERS-CoV).\(^1,2\)
- Around 600 cases have been reported worldwide.
- Mortality is unnervingly high (around 30%).
- Strong parallels with the SARS-CoV.


Image: [MERS-CoV (NIAID)](http://example.com)
MERS-CoV: clinical

- Characterised by fever progressing to pneumonia.
- Asymptomatic infection can occur.
- Gastrointestinal symptoms common.
- Mortality rate high (30%).

Potential for airborne dissemination, gastrointestinal shedding and asymptomatic carriage present infection prevention and control challenges

http://haicontroversies.blogspot.co.uk/2014/05/mers-primer.html
MERS-CoV: prevalence

http://virologydownunder.blogspot.co.uk/
MERS-CoV: what’s going on?

1. Reporting spike?
2. Localized outbreak in Saudi Arabia?
3. Bottom of a global epi curve?
MERS-CoV: global spread

http://virologydownunder.blogspot.co.uk/
MERS-CoV: healthcare worker risk

Number of healthcare workers (HCWs) among all MERS-CoV cases

n=286 total MERS-CoV cases worldwide
n=80 healthcare workers with MERS-CoV
Updated: 26.04.14

http://virologydownunder.blogspot.co.uk/
MERS-CoV: is anywhere safe?

- May 2 2014: first reported US case
  - Munster, Indiana
  - Riyadh (Saudi Arabia) -> London -> Chicago -> Indiana

- May 11 2014: second reported US case
  - Orlando, Florida
  - Jeddah (Saudi Arabia) -> London -> Boston -> Atlanta -> Orlando

- Both were healthcare providers who had been working in Saudi Arabia.
Prevention and control: CDC guidelines

Airborne & contact precautions

- Airborne infection isolation room (AIIR) where possible
- Gloves, gowns, eye protection, N95 mask + hand hygiene
- Standard environmental disinfection

Prevention and control: droplet or airborne?

- MERS-CoV is a respiratory virus, so the most important route of transmission is likely to be droplet spread through close contact with infected individuals.
- However, airborne transmission cannot be ruled out (hence the CDC recommendation for airborne precautions).
- Recent data indicate that small droplet nuclei may be emitted most of the time by influenza infected patients, which justifies airborne precautions.¹

Prevention and control: fomite transmission?

- Contact transmission, including direct or indirect contact with contaminated surfaces does occur in some cases based on findings from other influenza and coronaviruses (such as SARS-CoV).\(^1,2\)
- SARS-CoV and surrogates can survive on dry surfaces for weeks, and is better able to do so than related human coronaviruses.\(^1,3\)
- MERS-CoV has been shown to survive on dry surfaces for hours; studies evaluating extended survival times / conditions currently lacking.\(^5\)
- In addition to survival on dry hospital surfaces, aerosols of human coronaviruses and influenza viruses can survive in the air for long periods of time. For example, a human coronavirus aerosol was able to survive for 6 days in one study.\(^6\)

Prevention and control: MERS-CoV survival

A role for automated room disinfection?

- A range of disinfectants are effective against human coronaviruses, including alcohol, quaternary ammonium compounds, bleach and other disinfectants.\(^2\)
- However, studies with other organisms have demonstrated that conventional methods consistently fail to eliminate contamination with pathogens that can survive on surfaces such as *C. difficile*, MRSA and norovirus.\(^2\)
- Hydrogen peroxide vapor (HPV) is effective *in vitro* for the inactivation of influenza and coronaviruses (see table below) and eliminates pathogens from hospital surfaces.\(^3,4\)
- HPV also inactivates pathogens from the air, so would be effective for eliminating persistent MERS-CoV aerosols.

<table>
<thead>
<tr>
<th>Virus (strain)</th>
<th>Log(<em>{10}) reduction in virus titer (TCID(</em>{50})) ± (SD) after HPV Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25 mL*</td>
</tr>
<tr>
<td>TGEV (SARS-CoV surrogate)</td>
<td>&gt;5.05 (0.19)</td>
</tr>
<tr>
<td>Avian influenza virus (H9N9)</td>
<td>&gt;4.08 (0.58)</td>
</tr>
<tr>
<td>Swine influenza virus (H3N2)</td>
<td>&gt;3.83 (0.14)</td>
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</tbody>
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Data from Goyal et al.\(^4\)

Prevention and control: theory and practise

MERS-CoV: summary

1. MERS-CoV is a respiratory virus with a high mortality rate.

2. Human-to-human transmission seems to be uncommon currently.

3. However, global prevalence is increasing.

4. The best way to protect you and your patients is to comply with CDC guidelines: apply strict airborne and contact precautions.
Other sources for information

- CDC MERS pages
- WHO MERS pages
- Virology Down Under blog (images used with permission of Dr Ian MacKay)
- Controversies in HAI blog