Novel Coronavirus: nCoV-2019
COVID-19
SARS-CoV-2


Guido van Marle, MSc, PhD
Dept. Microbiology Immunology & Infectious Disease
Cumming School of Medicine
University of Calgary

Coronaviruses
- Order: Nidovirales
- Family: Coronaviridae
  - Subfamily: Orthocoronavirinae
- Positive Strand RNA virus
- Genome size up to ~26-32 kb
- Host ranges mammals and avians
  - Important veterinary pathogens
    - IBV, TGEV, PEDV
- Humans
  - Common cold hCoV 229E, NL63, OC43
  - Middle Eastern Respiratory Syndrome (MERS) CoV
  - Severe Acute Respiratory Syndrome (SARS) CoV
  - SARS-CoV-2 (COVID-19)

Emergence of Coronaviruses

<table>
<thead>
<tr>
<th>Virus</th>
<th>Species</th>
<th>Emergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCoV-NL63</td>
<td>Human</td>
<td>500-800 years</td>
</tr>
<tr>
<td>HCoV-229E</td>
<td>Human</td>
<td>200-300 years</td>
</tr>
<tr>
<td>HCoV-OC43</td>
<td>Human</td>
<td>~120 years</td>
</tr>
<tr>
<td>PEDV</td>
<td>Porcine</td>
<td>~25 years</td>
</tr>
<tr>
<td>rBCoV</td>
<td>Bovine</td>
<td>~25 years</td>
</tr>
<tr>
<td>SARS-CoV</td>
<td>Human</td>
<td>~16 years</td>
</tr>
<tr>
<td>MERS-CoV</td>
<td>Human</td>
<td>~7 years</td>
</tr>
<tr>
<td>SADS-CoV (HKU2)</td>
<td>Porcine</td>
<td>~2 years</td>
</tr>
<tr>
<td>SARS-CoV-2</td>
<td>Human</td>
<td>Present</td>
</tr>
</tbody>
</table>


ICTV 9th Report [2011]


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Host “Jumping” MERS CoV

Origin Bats
Less human to human transmission so far

Lu et al. Lancet 2020; 395: 565–74

Animal Origin SARS-CoV-2 (COVID 19)?

Did pangolins spread coronavirus to people?

Therapeutic Approaches & Vaccines?

Potential Vaccines:
- Targets structural proteins (S, M, N)
- Humoral and Cellular Immune are protective

But:
- Antibody Dependent Enhancement of infection (ADE)?
- Other Immune Pathologies?
- Longevity of Response?
- Immune escape?

Potential Antivirals:
- Block virus binding or entering cells
- Protease inhibitors against viral proteases
  - Papain like proteases
  - Chymotrypsin like proteases
- Target other Non Structural Proteins [nsp].
  - Replicate (Remdesivir)
- Target Viral Accessory Proteins
- Target Interferon Responses
- Other cellular processes & antiviral responses

Coronavirus Life cycle

Receptors for Cell Entry
- HCoV-229E   APN
- HCoV-NL63   ACE2
- TGEV   APN
- PEDV   APN
- FIPV   APN
- CCoV   APN
- MHV   mCEACAM
- SARS-CoV   ACE2
- MERS-CoV   DPP4

Fehr & Perlmutter
Methods Mol Biol.

Fung et al.
Front Microbiol
(2014) 5:296

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