Covid 19
BioEngineering Advisory Board Webinar

Therapeutics
Covid-19 – Therapeutic Objectives

• Treat severe patients requiring significant intervention

• Reduce the overall course of the disease

• Prophylaxis to reduce “catching” the disease

Covid-19 affects many “body systems” and multiple approaches may be needed
Covid-19 – Existing Therapeutic Options

• Anti-virals - Stop the virus from spreading in the body

• Anti-inflammatories – Reduce the “cytokine storm” which may be triggering severe complications

• Ancillary Therapies – Help improve immune response, restore damage
Covid-19 – ~2000 Trials Worldwide with Existing Therapies

• Anti-virals/Protease Inhibitors - Stop/Slow the virus
  – Remdesivir, Favipiravir, Ritonovir/Lopinavir

• Anti-inflammatories – Reduce the “cytokine storm” which may be triggering severe complications
  – Sarilumab, Tociluzumab, Hydroxychloroquine

• Ancillary Therapies – Help improve immune response, restore damage
  – Convalescent Plasma Therapy, Stem Cell Therapy
# COVID-19: Frontrunners in Treatment

## Treatment Developments & Timeline

<table>
<thead>
<tr>
<th></th>
<th>Q1 2020</th>
<th>Q2 2020</th>
<th>Q3 2020</th>
<th>Q4 2020</th>
<th>2021+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remdesivir</strong></td>
<td></td>
<td>Phase III Study shows that it Cuts hospital stays by 31% compared to placebo.</td>
<td></td>
<td></td>
<td>FDA Authorization for Emergency Use</td>
</tr>
<tr>
<td><strong>Ritonovir/Lopinavir</strong></td>
<td></td>
<td></td>
<td>Phase II Study shows positive results for combination therapy with Ribavirin and IFN-beta</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Favipiravir</strong></td>
<td>Russian Study with 40 patients shows 65% patient tested -ve for coronavirus at 10th day</td>
<td>Preliminary Clinical Trial Data</td>
<td></td>
<td></td>
<td>Avigan’s (Fujifilm) trial final results expected in Jul</td>
</tr>
<tr>
<td><strong>Sarilumab</strong></td>
<td></td>
<td></td>
<td>Interim result of Regeneron trial of 457 patients shows promise for only Critical Patients and not Severe patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tocilizumab</strong></td>
<td></td>
<td></td>
<td>Roche Study demonstrates significant decrease in mortality</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Convalescent Plasma therapy</strong></td>
<td></td>
<td></td>
<td>FDA Authorization for Emergency Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stem cell therapy</strong></td>
<td></td>
<td>ADSCC shows positive results for 73 patients</td>
<td></td>
<td></td>
<td>Mesoblast Phase III trial initiated</td>
</tr>
<tr>
<td><strong>Hydroxychloroquine</strong></td>
<td></td>
<td></td>
<td>3 observation studies at NY, France and Albany for +2,500 patients shows no significant benefit of HCQ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Preliminary Clinical Trial Data**: Preliminary data from clinical trials.
- **Other Preclinical/Supportive Data**: Other data supporting treatment efficacy.
- **Early Access Approval**: Approval for emergency use.
- **Trial Status**: Status of ongoing clinical trials.
Covid-19 – New Rules For New Drugs – Vir Biotechnologoy

• April 6, 2020 – Announce collaboration with GSK on S309 antibody isolated from a patient who recovered from severe acute respiratory syndrome (SARS) in 2003
• May 18, 2020 – Announce “S309, an antibody isolated from a, which has been shown to prevent SARS-CoV-2 live virus infection of cells”; Two new antibodies drug candidates, VIR-7831 and VIR-7832 derived by S309
• May 29, 2020 – Manufacturing agreement with Biogen/GSK/Samsung for production of both antibodies
• Phase II trials plan to start this summer

3 Years REDUCED to 3 Months

• Develop disease model systems?

• Predict combination drug approaches?

• Speed up production systems for novel therapies?

• ??????