Will emerging data allow increased reliance on vaccine immune responses for public health and regulatory decision-making?

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The Cellular Immune Correlates and Implication on Protection Against New COVID-19 Variants

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Vaccine immunity and assays

- Subunit vaccines vs. inactivated virus vaccines
- Antibody vs. cellular immunity
- Population immune protection diversity
  high, medium, low, no protection
Parry, H. et al. Differential immunogenicity of BNT162b2 or ChAdOx1 vaccines after extended-interval homologous dual vaccination in older people. *Immun Ageing* 18, 34 (2021)

**Spike-specific vaccine responses in younger and older cohorts.**

Responses following single or dual vaccination with A) BNT162b2 or B) ChAdOx1 in donors aged 80+ or 42–79 years. i) Spike-specific antibody responses by age and by vaccine dose. ii) Spike-specific Elispot response following second vaccine
B.1.617.2 exhibited reduced Ab neutralization sensitivity

Mlcochova, P. et al. SARS-CoV-2 B.1.617.2 Delta variant replication, sensitivity to neutralising antibodies and vaccine breakthrough.

http://biorxiv.org/lookup/doi/10.1101/2021.05.08.443253 (2021)
doi:10.1101/2021.05.08.443253
Effectiveness of inactivated COVID-19 vaccines against COVID-19 pneumonia and severe illness caused by the B.1.617.2 (Delta) variant: evidence from an outbreak in Guangdong, China

Kang et al.

Implications:

The study (total 10,813 subjects) provides strong evidence that full-series vaccination with inactivated COVID-19 vaccines reduce risk of pneumonia and severe illness from the B.1.617.2 variant.

(Not peer-reviewed preprint, Aug. 2021)
Population protective immunity profile (unvaccinated)

Public Cellular Immunity to SARS-CoV-2

- **Spike (S)**
  - High response: 10%
  - Med response: 13%
  - Low response: 17%
  - No response: 60%

- **Envelope (E)**
  - High response: 56%
  - Med response: 17%
  - Low response: 20%
  - No response: 7%

- **Membrane (M)**
  - High response: 73%
  - Med response: 14%
  - Low response: 3%
  - No response: 10%

- **Nucleocapsid (N)**
  - High response: 67%
  - Med response: 17%
  - Low response: 10%
  - No response: 6%

- **Protease (P)**
  - High response: 70%
  - Med response: 17%
  - Low response: 10%
  - No response: 3%

- **SMENP**
  - High response: 23%
  - Med response: 10%
  - Low response: 10%
  - No response: 60%
### Table A

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<thead>
<tr>
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<th>CTL</th>
<th>SMENP</th>
<th>S</th>
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<tr>
<td>No response 1</td>
<td>184.5±8</td>
<td>251±14</td>
<td>325.5±29</td>
<td>269.5±16</td>
<td>101.5±12</td>
<td>376±16</td>
<td>194.5±13</td>
<td>169±11</td>
<td>938.5±6</td>
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<tr>
<td>No response 2</td>
<td>23±4</td>
<td>462±6</td>
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<td>452.5±19</td>
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### Graph B

#### No response donor 1

![Graph showing IFN-γ specific spot fold of increase](image)

#### No response donor 2

![Graph showing IFN-γ specific spot fold of increase](image)
Before/After Inactivated SARS-CoV-2 Vaccines
ELISPOT Assay

Spot forming cells $1 \times 10^5$ PBMC

* $P < 0.05$
** $P < 0.01$
Vaccine immunity and assays

• Subunit vaccines vs. inactivated virus vaccines
  ✓ Evidence supports that all vaccines can help reduce severity and death of COVID-19 still.

• Antibody vs. cellular immunity
  ✓ The Delta variants have gradually escaped the current vaccine immunity, but cellular immune assay beyond the Spike-based assay is urgently needed.

• Population immune protection diversity
  ✓ Continued efforts are needed to closely monitor the population cellular immunity to SARS-CoV-2.