Emerging opportunities in vaccine innovation

DCVMN Webinar
June 22, 2021
Vaccine innovation includes both improving current vaccines as well as developing novel vaccines for diseases for which no vaccine exists

<table>
<thead>
<tr>
<th>Improved vaccines</th>
<th>Novel vaccines</th>
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<tbody>
<tr>
<td><em>Offer additional value over existing products for the same disease</em></td>
<td><em>For diseases with no vaccine available</em></td>
</tr>
<tr>
<td>• Improvements can take many forms e.g.,</td>
<td>• Address unmet health needs</td>
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</table>
|   • **Increasing efficacy** (e.g., increasing PCV, HPV serotype coverage, etc.) | • Needs often characterized based on direct mortality but may also be benchmarked to other factors e.g.,
|   • **Increasing ease of implementation / delivery** (e.g., MR microarray patch, combination vaccines such as hexa, heat stable rota, etc.) |   • Morbidity                                      |
|   • **Decreasing price** (e.g., lower COGS technologies) |   • Epidemic potential                             |
|                                          | • Impact on AMR (antimicrobial resistance)         |
|                                          | • Novel vaccines for needs related to these alternative factors typically require a unique business case |

*Today's webinar will focus on evaluating opportunities within novel vaccine development while recognizing that improved vaccines may also play an important role in DCVM innovation strategies and pipelines*
Prioritization for novel vaccine development may be evaluated based on detailed analysis of 1) commercial opportunity and 2) developer fit.

<table>
<thead>
<tr>
<th>Commercial Opportunity</th>
<th>Developer Fit</th>
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<tbody>
<tr>
<td><strong>Health burden and need</strong></td>
<td><strong>Technical expertise</strong></td>
</tr>
<tr>
<td>• Unaddressed mortality and morbidity of disease</td>
<td>• Ability to successfully develop / manufacture technology</td>
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<tr>
<td><strong>Total market size</strong></td>
<td><strong>Go-to market reach</strong></td>
</tr>
<tr>
<td>• Total demand (based on expected uptake)</td>
<td>• Ability to access / compete in relevant markets</td>
</tr>
<tr>
<td>• Pricing potential</td>
<td></td>
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<tr>
<td><strong>Competitive landscape</strong></td>
<td><strong>Strategic fit</strong></td>
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<tr>
<td>• Likely share if potential for multiple novel entrants</td>
<td>• Contribution to company objectives / long-term vision</td>
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<td></td>
<td><strong>Portfolio balance</strong></td>
</tr>
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<td>• Complements / offers synergy with broader portfolio</td>
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Please contact CHAI if you would like tailored support in evaluating novel vaccine development opportunities.
Understanding key drivers of vaccine preventable deaths is one lens through which to identify needs in novel vaccine development

Global U5 deaths from infectious disease causes (2019)¹

- Novel vaccine needed: 1,107 K
- Vaccine available: 995 K
- <20 K deaths per disease: 83 K
- Deaths not classified: 160 K

Global U5 deaths from infectious disease needing novel vaccines² (2019)¹

- 356k: Malaria
- 124k: RSV
- 94k: Shigella
- 83k: Adenovirus
- 81k: Syphilis
- 78k: Cryptosporidium
- 59k: Campylobacter
- 50k: Tuberculosis
- 50k: iNTS
- 49k: HIV/AIDS
- 43k: Norovirus
- 39k: Non-typhoidal Salm.

Source: ¹IHME GBD Data. ²Note: List of diseases does not consider technical feasibility of development – for several diseases there may be no vaccines currently in development. RSV: Respiratory syncytial virus. iNTS: Invasive non-typhoidal salmonella. NTS: Non-typhoidal salmonella.
CHAI conducted a high-level assessment of the market potential of several novel vaccines, considering both L/MIC and HIC opportunities

Non-Exhaustive

Note: Vaccines assessed included those nearing or in Phase 2/3, which are prioritized by partners and have notable burden – they do not necessarily correspond 1:1 with optimal opportunities for DCVMs
Within novel vaccine development, there are several novel vaccine archetypes and today we will evaluate case studies across archetypes.

### Decreasing burden and clarity of market opportunity

<table>
<thead>
<tr>
<th>Description</th>
<th>The “Big Three”: High burden, defined opportunity</th>
<th>Moderate burden, defined opportunity</th>
<th>Moderate burden, uncertain market opportunity</th>
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<tbody>
<tr>
<td><strong>Description</strong></td>
<td>• Infectious diseases with the highest annual deaths</td>
<td></td>
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<td></td>
<td>• Clear expectation of market opportunity due to high burden</td>
<td></td>
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<tr>
<td>Examples</td>
<td>• TB, HIV, Malaria</td>
<td>• RSV</td>
<td>• Shigella, iNTS</td>
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<tr>
<td>Today’s deep dive</td>
<td>• TB</td>
<td>• RSV</td>
<td>• GBS</td>
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</table>
TB is the world’s biggest infectious killer, and vaccine is a major priority for global partners, donors and some high-burden countries

**Health burden and need**

- Models show adolescent/adult vaccine likely greatest impact
- Most absolute burden is in key MICs (RSA, China, India), but many LICs have significant need

**Total market size**

*Focus on adult/adolescent vaccine*

Key factors informing market size:

- **Eligible population**
  Adults/adolescents in high- and mid-burden countries
- **Uptake**: TB burden well-understood, but funder policy remains open
- **Coverage**: Challenges of adult vaccine delivery

**Competitive landscape**

*Focus on adult/adolescent vaccine*

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>8</td>
<td>2</td>
</tr>
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</table>

- M72/AS01 candidate expected to enter Ph 3 in 2023
- Opportunity for manufacturing partnerships may emerge
- See tools from TBVI and IAVI: https://www.tbvacpathway.org/

**Key Takeaways**

- High priority for funders and countries
- Developers may require partnerships with manufacturers to achieve LMIC access
- Some DCVMN members already playing key role
RSV presents a clear health need with likely Gavi funding despite possible uptake challenges: however, to date DCVM RSV development limited

**Health burden and need**

<table>
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<tr>
<th>Global RSV Deaths by Age (2019)</th>
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<tr>
<td>&lt;6 6 mo. 5 to 50 to 50 to 70+</td>
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<tr>
<td>Global mo. to 5 49 69 70+</td>
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<td>338 K 56 K 68 K 21 K 33 K 160 K</td>
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**Total market size**

Focused on infant mAb and maternal vaccine

- Key factors informing market size:
  - **Eligible population**: Live births (mAb) or pregnancies (vx)
  - **Uptake**: Limited awareness and surveillance may slow uptake, but have in principle Gavi support
  - **Coverage**: Platform challenges

**Competitive landscape**

Focused on infant mAb and maternal vaccine

- 1 vx
- Ph. 1
- Ph. 2
- Ph. 3
- 2 mAbs
- 2 vxs

**Key Takeaways**

- If market materializes as expected, there might be a potential opportunity for DCVMs to help facilitate L/MIC access, e.g., via a tech transfer

GBS poses a moderately high disease burden in infants, but an uncertain commercial opportunity may have limited development to date

<table>
<thead>
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<th>Health burden and need</th>
<th>Total market size</th>
<th>Competitive landscape</th>
</tr>
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<tbody>
<tr>
<td>~147 K stillbirths and infant deaths annually¹</td>
<td>Key factors informing market size:</td>
<td>-</td>
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<tr>
<td>• Conservative estimate – may be greater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Burden highest in LMICs where screening pregnant women and use of antibiotic prophylaxis limited → ~65% of still births and infant deaths in Africa</td>
<td></td>
<td>2 vx</td>
</tr>
<tr>
<td></td>
<td>• <strong>Eligible population:</strong> Pregnancies</td>
<td>Pfizer</td>
</tr>
<tr>
<td></td>
<td>• <strong>Uptake:</strong> Uncertain funder policy (e.g., Gavi, countries)</td>
<td>(2 doses)</td>
</tr>
<tr>
<td></td>
<td>• <strong>Coverage:</strong> May be limited by maternal platform challenges, particularly if two dose</td>
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**Key Takeaways**

- Need for greater clarity on commercial opportunity, particularly funding, despite moderately high burden
- If commercial opportunity confirmed, potential opportunity for DCVMs to play greater role in GBS given relatively sparse pipeline

In addition to determining which vaccines, considering the trade-offs of how (in-house vs. in-licensing) is also key for engaging on novel vaccines.

How to add novel vaccines to pipeline?

**In-house develop.**
- Avoids licensing costs
- Higher scientific and technical expertise needed

**In-licensing**
- Allows rapid access to expertise and technology

- While in-licensing offers key benefits, 2019 survey of ~20 DCVMs found only ~20% of innovation programs were in-licensed and **> 60% of DCVMs noted limited access to partnerships** as a barrier to novel vaccines
- Increased access to in-licensing opportunities needed

Key questions for in-house vs. in-licensing

- Capabilities needed (i.e., technical)?
- Cost and resources needed?
- Time-to-market for in-house vs. in-licensing?
- Availability of candidates for in-licensing?
- Specific benefits of in-licensing?
- IP landscape?

Potential challenges for DCVMs innovating can be divided into four categories – each of which will require specific efforts to overcome

- **Financial**
  - Financing novel vaccine development can be challenging given high risks and uncertain markets

- **Commercial**
  - Manufacturers need frameworks to clarify the commercial case for novel vaccines and identify information gaps
  - WHO is trying to reduce the time between licensure and introduction in LMICs

- **Technical**
  - Ensuring access to appropriate technologies
  - Identifying trial endpoints

- **Network**
  - Manufacturers have built many new partnerships during Covid, building on high attention to this space
  - Funders of early-stage R&D should facilitate connections between their grantees and clinical developers and manufacturers
  - Funders could also incentivize early-stage grantees to accelerate commercialization plans and initiate partnerships
Q&A Session

Thank you for your participation!

Please contact Alex Bowles (abowles@clintonhealthaccess.org) with any questions.

www.clintonhealthaccess.org