Novel strategies to improve vaccine coverage and equity

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Partners involved
Overview

• Anticipated paradigm shifts in immunization strategies
• Total systems effectiveness (TSE)
• Vaccine Innovation Prioritization Strategy (VIPS)
• Specific examples of innovative vaccine delivery approaches:
  o Microarray patches (MAPs)
  o Controlled temperature chain (CTC)
PROBLEM: 19.9 million under 1 year olds are unimmunized, globally.
Moving forward, most of the un-vaccinated will be in middle income countries and in geographically clustered areas sub-nationally located in key countries.
Solution? A sub-national approach to improve coverage and equity
2. Paradigm shifts for global immunization

The next decade will likely see shift to differentiated approaches being used in the same country...

....focusing on urban poor in the first mile, rural poor in the last mile, and vulnerable populations in fragile/conflict/post-conflict countries
The existing approaches are not enough
Potential novel delivery approaches

- Controlled temperature chain (CTC)
- Next generation compact pre-filled autodisable device
- Microarray patch
- Integrated reconstitution device
Solution? Develop innovative vaccine products to improve equitable vaccine coverage

Population density

Single/Multi-dose vials

Increase in logistical complexity

Cost to immunize a child = Product cost + Delivery cost

Includes the new approach

Strategy to reach under-immunized
3. Paradigm shifts for global immunization

The next decade is likely to focus on scaling up existing vaccines and switching products (ex: OPV to IPV, Measles to MR or TT to Td)

...or choices on product presentations / new delivery technologies, each presenting important trade-offs that will need to be evaluated
Examples of differentiated products

- Price
- Number of doses
- Wastage
- Storage
- Cold chain footprint
- Route of administration
Solution? Better understanding of and responding to country needs

Countries have a better opportunity to express their preferences and articulate demand for different products

Need a tool and a process to be able to evaluate the trade-offs between different products, in the context of their immunization barriers

Better representation of country needs, including needs related to innovation, at the global level
Total Systems Effectiveness (TSE) is an approach to evaluate tradeoffs between cost to immunize a child vs individual and population based benefit of improving coverage and equity.

FUTURE STRATEGY TO REACH 5th CHILD

Includes the new approach

Δ between cost to immunize a child vs population based benefit of improving coverage and equity

increase in logistical complexity
What is the status of TSE today?

Rationale for TSE, role of the pilot

Current decision-making process

Activity: using TSE for decision-making

Discussion: Is TSE useful? For which decisions? Recommendations?
Vaccine Innovation Prioritisation Strategy (VIPS)

VISION

- Innovation is one of the Alliance priorities for shaping markets to the benefit of Gavi-supported countries.
- In this strategic period, the Alliance aims to pursue a common agenda of driving vaccine product innovation to better meet country needs and support Alliance goals on immunisation coverage and equity.

GOAL

- Prioritise innovations in vaccine product attributes to provide greater clarity to manufacturers and partners to make investment decisions.
Vaccine Innovation Prioritisation Strategy (VIPS)

**VIPS: Vision and goal**

**VISION**

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Logos for Gavi, World Health Organization, Bill & Melinda Gates Foundation, PATH, and UNICEF.
Scope of antigen agnostic vaccine innovations

**Primary containers**
i.e. Compact pre-filled autodisable device (cPAD);
Blow-fill-seal (BFS) container;

**Formulation**
i.e. Heat-stable formulations;
Freeze-stable formulations

**Packaging**
i.e. Bundling accessories; Packed volume

**Labelling**
i.e. barcode including global trade item number (GTIN); temperature indicators

**Delivery technologies**
i.e. Disposable-syringe jet injector;
Dry powder inhaler; Nebuliser;
Electroporation device
VIPS will prioritise first antigen-agnostic innovations, then antigen-specific innovations.
How are TSE and VIPS related?

Country preferences inform both existing products, and pipeline products – and will inform the VIPS process.

Country preferences on products and attributes inform both existing products, and pipeline products – and will inform the VIPS process.

TSE informs the PUBLIC HEALTH VALUE PROPOSITION for new products.
Product development of VIPS prioritized innovations

Innovation → Product Development → Manufacturing → Licensure → Recommendation

/ TSE

Monitoring & Evaluation → Administration → Distribution → Financing & Procurement

World Health Organization
How can TSE inform product development of VIPS prioritized innovations?

**Target Product Profiles**
- Preferences
- Use case
- Demand

**Scale/ COGs**
- Increased coverage and equity
- Easier delivery

**Programmatic suitability**
- Alignment on financing priorities
Benefits and current limitation of the TSE/VIPS approach

- Products shaped by country need
- Alignment across global stakeholders
- Consistent messaging on priorities
- Holistic, end to end approach
- Better use of resources

- TSE and VIPS initiatives are early stage
- In parallel to prioritization, we are working on how to increase resources for development
- Investment by manufacturers may depend on other aspects: market assessment, pathway, procurement mechanism...

The environment is dynamic and likely to change in the lifespan of product development
Specific examples of innovative vaccine delivery approaches:

1. Microarray patches (MAP)
2. controlled temperature chain (CTC)
What are Microarray Patches (MAPs)?

- Needle-free
- Consist of an array of hundreds of small solid-coated or dissolvable projections, up to 1 mm in length, that deliver a dry formulation of vaccine into the upper layers of the skin.
- Target the high density of antigen-presenting cells in the dermis responsible for the immunologic response (potential for dose sparing)
- Likely to be single dose, single use
- May require an applicator, either integrated, or separate, with the potential for re-loading
- Disposal in biohazard waste
Potential game-changing attributes of MAPs

Remove the need for reconstitution

Remove the needle waste

Reduce the storage needs, and need for a cold chain

Ease of administration
The challenges in product development of MAPs

- Unclear use case: unclear market
- Requires capital investment in manufacturing line
- Partnership between Vx and MAP developer: complexity
- Uncertain procurement mechanism: willingness to pay
  - Unclear value proposition for investment

Will understanding country preferences, use case, potential market, by applying TSE, and prioritization by VIPS be helpful to vaccine manufacturer decision making?
Programmatic definition of Controlled Temperature Chain (CTC)

...a specific set of conditions allowing for a vaccine to be stored and transported outside of the traditional 2°C to 8°C cold chain

- One excursion, just prior to administration
- Ambient temperatures up to 40°
- Specifically limited duration (at least 3 days)

Currently limited to vaccines used in special campaigns
The extra reach of CTC

Priority vaccines for CTC:

- Human papillomavirus (HPV);
- Oral cholera vaccine (OCV);
- Tetanus toxoid vaccine;
- Hepatitis B vaccine birth dose (HepB-BD)

CTC’s greatest value is in the last mile, to facilitate outreach
The challenges in product development of CTC

- Limited to specific vaccines that are delivered in special campaigns, not in a bundle
- Requires manufacturers to generate stability data at 40C, and license for CTC
- In-country uptake and demand generation has been challenging
- Longer thermostability timeframes may be technically feasible for some vaccines which would bring significant programmatic advantages over the current 3 day window

TSE intends to help countries to better understand the value and potential impact of CTC

...and to inform country preferences for thermostability requirements, and appropriate vaccine bundling

Will prioritization of CTC by VIPS be informative and compelling to vaccine manufacturer decision making?
Thanks!
Innovative Technologies

Panel Discussion
DCVMN meeting – Kunming, China
31 October 2018

How can the TSE and VIPS initiatives better identify and advance priority innovations for vaccines that will help countries meet their immunization coverage and equity goals and other needs?

Abbreviations: DCVMN, Developing Countries Vaccine Manufacturers Network; TSE, Total Systems Effectiveness; VIPS, Vaccine Innovation Prioritisation Strategy.
Examples of Successful Innovations Advanced to Date

Auto-disable Syringes

Vaccine Vial Monitors

Volume Reductions

Before

First-generation rotavirus vaccine: 156 cm³ per dose

After

Third-generation rotavirus vaccine: 12 cm³ per dose

7.6 billion supplied

Photos left to right: World Health Organization (WHO), WHO, GlaxoSmithKline, PATH.
Examples of Successful Innovations Advanced to Date

Controlled Temperature Chain (CTC) Qualified Vaccines

MenAfriVac® meningitis A vaccine

Gardasil™ human papillomavirus vaccine

Shanchol™ oral cholera vaccine

4 million doses delivered in a CTC

Novel Primary Containers

Rotarix™ rotavirus vaccine

Euvichol® oral cholera vaccine

Rotasiil® rotavirus vaccine
Examples of Emerging and Future Innovations for Vaccines

Coated microarray patch

Blow-fill-seal compact prefilled auto-disable device

Blow-fill-seal container with insert (septum)

Dissolving microarray patch

Sublingual fast dissolving tablets or gels

Integrated reconstitution technology

Disposable-syringe jet injector

Top row photos left to right: Vaxxas, PATH, Rommelag, Georgia Tech.
Bottom row photos: PATH, Hilleman Laboratories, PATH.