Vaccine Microarray Patches (VMAPs)

unicef
for every child
Supply Division

Overview

The challenge

Vaccines play a critical role in ending preventable child deaths, saving two to three million lives each year. However, coverage varies widely among and within countries. Many children from marginalized, vulnerable, fragile and conflict-affected communities lack access to immunization services. In 2020, 22.7 million children did not receive basic vaccines (DTP3 and MCV1). Of these, 17.1 million received no vaccines, also referred to as 'zero dose' children.

In some countries, immunization coverage has plateaued or even reversed. Recent outbreaks of measles and vaccine-derived polioviruses demonstrate the importance of sustaining high levels of coverage to eliminate and eradicate diseases.

There are difficulties in reaching the last mile with the current injectable vaccines since they depend on a functional cold-chain and administration by well-trained staff, which can be challenging especially when working in unstable environments and harsh climates. Furthermore, most vaccines are administered via injection that may cause pain, and discomfort that leads to hesitancy, in addition to the risks of hazardous waste from syringes.

The response

A groundbreaking innovative technology with the potential to significantly increase global immunization coverage is the v*accine-containing microrray patch* (VMAP), an intradermal delivery technology for vaccinations. VMAPs provide an alternative to intramuscular and subcutaneous immunization methods and have the potential to increase acceptability by caregivers and recipients while making vaccines easier to administer. VMAPs do not require the use of needles and can improve safety during administration, reduce the need for cold chains, enable easier storage and transport and remove the risks of needle waste.

While a number of MAP technologies are currently in development, the global research and development community has identified certain barriers to bringing them to scale, including a lack of market incentives by vaccine manufacturers to pursue the development of this technology.

UNICEF is focusing on driving the research, development and scale of VMAPs. Some current activities include identifying barriers for scaling and investigating the need for market pull incentives to spark interest and endorsement by vaccine manufacturers. The end-goal is to ensure a high-quality product can be used in the challenging environments that UNICEF operates.

The impact

VMAPs can directly contribute to increasing immunization coverage and decreasing the occurrence and impact of outbreaks. They can be integrated into new and existing strategies and immunization plans, including those for disease-specific programmes to control, eliminate or eradicate diseases.

VMAPs have the potential to substantially improve the productivity and resilience of governments to expand immunization coverage and prevent millions of deaths through a more equitable access to vaccines.

Key figures

Issue

22.7 million children did not receive basic vaccines in 2020.

17.1 million children received no vaccines in 2020, known as "zero dose children".

207,000 people died from measles outbreaks in 2019.

140% increase of measles cases reported in 2019 vs. 2018.

Key features

40°C qualified for storage for 3 days (preferably longer).

Low volume/weight to enable reaching children in the last mile.

Low cost of goods/dose to make VMAP price competitive to the current multidose vaccines.

Impact

20% of the "zero dose" children are envisioned to be reached with a VMAP by 2030

Vaccine Microarray Patches (VMAPs)

Status on VMAP technology

Technology types: There are two types of MAP technologies currently in development to deliver dried vaccines: (1) a coated micro needle array; and (2) dissolvable microneedle array-based patches. VMAPs currently in development include vaccines for the human papilloma virus (HPV), influenza, measles (M) & rubella (R), and rabies.

Studies: The first phase of clinical studies have shown that both types of MAPs can induce seroconversion via a painless and safe application, as no notable side reactions were detected except for a mild local erythema in some patients.[1,2,3] Initial user-acceptability studies with prototypes of both types have shown that these technologies have the potential to increase acceptability among recipients as well as vaccinators.

Target Product Profile: UNICEF and the World Health Organization (WHO) have co-published a Measles-Rubella Microarray Patch Target Product Profile (TPP) to communicate the requirements for MR-MAP development to developers and vaccine manufacturers.

Next steps

In the short term, UNICEF aims to quantify the added value of VMAPs by analyzing the public health benefits vs. costs and investigating the needs for intervention. This includes implementation research and analysis of pull incentives, procurement mechanisms and investments needed to drive scale.

Accelerating the introduction of VMAPs also requires an extensive long-term strategy to ensure integration into routine immunization programmes, preventative campaigns and responses to outbreaks. In collaboration with global partners, UNICEF is developing road maps that includes assessments and quantifications of VMAP development, reoccurring costs and public health benefits. Focus is placed on markets where this technology is most advanced to determine how and where potential investments are required.

With over 70 years of delivering life-saving vaccines to millions of children worldwide, UNICEF is positioned to be a leader in innovating new vaccine delivery technologies for children. The organization has successfully driven the scale of numerous health innovations and policies, including autodisable injection devices (AD-syringes), vaccine vial monitors (VVMs), and (partial) swaps in vaccine product presentations. UNICEF has a wide range of ongoing activities related to immunizations and novel vaccine introductions, including health systems strengthening, implementation research, and vaccine forecasting and procurement. The organization is uniquely placed to drive the development of fit-for-purpose vaccines, policies, programmes and innovations.

Partner with UNICEF

UNICEF is seeking **US$250 million** to advance and drive the market introduction of VMAPs. The end goal is to successfully introduce the technology into programmes by 2030, and with two different VMAP types by 2035. The estimated funding required per work area is provided below.

- **US$20 million** to further quantify the trade-offs of VMAPs and support activities with global stakeholders, including the delivery of vaccine specific public health assessments, development of roadmaps and executing implementation research (year 1-5).
- **US$230 million** to secure global access to VMAPs, introduce targeted VMAP strategies for 2030-2035 via (advanced) procurement of the first VMAPs, and generate demand at the country level (year 3 – 5)

Global partnerships

UNICEF is collaborating with global stakeholders including the Global Alliance for Vaccines and Immunizations (GAVI), World Health Organization (WHO), Program for Appropriate Technology in Health (PATH) and the Bill and Melinda Gates Foundation to drive the development and scale of VMAPs.

Important initiatives and workgroups include:

1. The Vaccine Innovation Prioritization Strategy (VIPS) prioritizes innovations in vaccine delivery for increased coverage and equity. VMAP technology has been qualified as one of the three VIPS-prioritized vaccine delivery innovations based on potential public health impact.
2. The Measles and Rubella MAP Working Group, chaired by WHO.
3. The PATH's Centre of Excellence for Microarray Patch Technology

VIPS VACCINE INNOVATION PRIORITISATION STRATEGY
Gavi The Vaccine Alliance
BILL & MELINDA GATES foundation
PATH
World Health Organization

For more information: www.unicef.org/innovation/productinnovation

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