

VIPS Phase I executive summary: Solid-dose implants with applicator

June 2019

Solid-dose implants (SDIs) with applicator

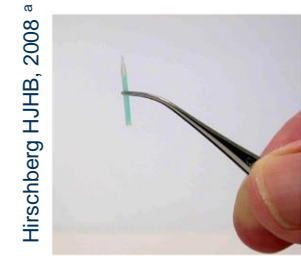


About SDIs

- SDIs consist of vaccines (including antigens, adjuvants and excipients) that have been reformulated into a solid format.
- A SDI is typically **shaped like a needle** that is sharp and strong enough to be **implanted below the skin** and the dose it contains either dissolves immediately or is released slowly.
- In some cases, SDIs are contained in a **cartridge or cassette** for easy handling prior to administration.
- An **applicator is used to propel the SDI into the skin** using a spring or compressed gas. The applicator might be separate and re-usable, or integrated and single use.

Stage of development

- SDIs are in a **very early stage of development**.
- **No clinical studies with vaccines have been published.**



Hirschberg HJHB, 2008^a

Separate, compressed gas-powered applicator (Bioneedle)



www.enesipharma.com^b

Separate, spring-powered applicator (Implavax®)



Nemauro presentation^c

Optional, separate applicator (Micropatch™)

^a Hirschberg HJHB, van de Wijdeven GGP, Kelder AB, van den Dobbelsteen GJW, Kersten GFA. Bioneedles as vaccine carriers. *Vaccine*. 2008 May 2;26(19):2389–97.

^b <https://www.enesipharma.com/technologies/platform/>

^c Nemauro presentation. Teriparatide microneedle patch for osteoporosis, December 2018. Presented during telecon 12 February 2019.

Solid-dose implants (SDIs) with applicator scorecard

Comparators: Single dose vial (SDV) (liquid) and autodisable (AD) needle and syringe (N&S); SDV (lyophilised) + diluent + reuse prevention (RUP) reconstitution N&S and AD N&S



Quality of evidence: Low

VIPS Criteria		Indicators	Comparators	
			Liquid	Lyophilised
Primary criteria	Health impact	Ability of the vaccine presentation to withstand heat exposure	Better	Neutral
		Ability of the vaccine presentation to withstand freeze exposure	Better	Neutral
	Coverage & Equity impact	Ease of use ^a	Better	Better
		Potential to reduce stock outs ^b	Neutral	Better
		Acceptability of the vaccine presentation to patients/caregivers	Better	Better
	Safety impact	Likelihood of contamination	Better	Better
		Likelihood of needle stick injury	Better	Better
		Total economic cost of storage and transportation of commodities per dose	Mixed	Mixed
	Economic costs	Total economic cost of the time spent by staff per dose	Neutral	Better
		Total introduction and recurrent costs ^c	Neutral	Neutral
Secondary criteria	Potential breadth of innovation use	Applicability of innovation to one or several types of vaccines	All parenteral vaccines are potential candidates.	
		Ability of the technology to facilitate novel vaccine combination	Yes	

Priority indicators - Country consultation		
RI* Facility	RI* Community	Campaigns
+	++	++
+	+	++
	+	+
		+
+		
++	++	+

* RI : Routine immunisation

++	Given significantly more importance
+	Given more importance
	Kept neutral

^a Ease of use can prevent missed opportunities and impact ability for lesser trained personnel to administer the vaccine, including self-administration
^b Based on the number of separate components necessary to deliver the vaccine or improved ability to track vaccine commodities
^c Total economic cost of one-time / upfront purchases or investments required to introduce the innovation and of recurrent costs associated with the innovation (not otherwise accounted for)

Solid-dose implants (SDIs) with applicator: Antigen applicability



- Solid-dose implants could theoretically be applied to **all vaccines that are currently delivered by injection.**
- The **need to dry the antigen** (which might preclude vaccines with aluminium-salt-based adjuvants) and **available payload volume** could potentially **limit the number and types of vaccine that can be incorporated into a solid dose implant.**
- Examples on the VIPS priority antigen list that might be suitable include **MR, IPV, and rabies vaccines.**

Solid-dose implants (SDIs) with applicator :

Assessment outcomes



KEY BENEFITS

- ++ Potential **increased ability to withstand heat and freeze exposure** (compared to liquid vaccines) as like lyophilised vaccines, SDIs are dry products with low moisture content
- **Potential to positively impact coverage and equity:**
 - ++ May be **easier to use: avoid the need for reconstitution** and require **less preparation**(compared to lyophilised vaccines)
 - May **improve dose control and reduce errors.**
 - Potentially suitable for **use by lesser trained vaccinators.**
 - Could **enable alternative delivery scenarios.**
 - Potential to **reduce stock-outs:** due to **fewer components to be procured, distributed, and tracked** (compared to lyophilised vaccines).
- ++ The limited data available suggest **increased acceptability** by caregivers/vaccines compared to standard needle and syringe.
- ++ **May improve safety:** Could reduce the **risk of contamination & needle-stick injuries**, as some SDIs have pre-loaded cassettes, and are sharps-free or have a concealed needle within the device.
- ++ May **save health care worker time** by eliminating need for reconstitution.
- **Broad applicability to all parenteral vaccines and might facilitate novel combination:**
 - At least one type of SDI might allow combination of different, previously lyophilised antigens thereby facilitating novel vaccine combinations. However, the limited payload may preclude this possibility.

KEY CHALLENGES

- **Rated lower than the comparator on some aspects of delivery costs:**
 - ++ SDIs may **increase cold chain volume and associated costs** since in-cold chain volume is likely to be larger than the single dose vial comparator.
 - However, SDIs with a reusable actuator could have a **smaller volume stored out of the cold chain on a per-dose basis.**

- ++ Important attribute for at least 2 settings or for the 3 settings based on the country consultation (see slide 3)
- ++ Important attribute for campaigns or routine facility-based immunisation based on country consultation (see slide 3)

Solid-dose implants (SDIs) with applicator: Rationale for prioritisation



- SDIs are **recommended to be prioritised** for further analysis under Phase II given their **potential high positive impact in the areas of health impact, coverage and equity, safety, delivery costs and their broad applicability.**

Additional important information to be analysed in phase II (if prioritised for Phase II):

- Vaccine specific reviews of the public health value proposition and technical feasibility.
- Review of technical readiness, commercial feasibility, and commodity costs.