Plenary Session 2: Landscape

Vaccine Thermostability

Next-Generation Vaccine Delivery Technology Meeting
Geneva, Switzerland

Name: **Raja Rao, Gates Foundation**

Email: **raja.rao@gatesfoundation.org**

Title: **Senior Program Officer**

Date: February 18, 2014

Improving thermostability is critical to achieve immunization goals

Thermostability & immunization goals

Increase coverage…

…by stocking vaccines at facilities that do not have cold chain equipment

Improve efficacy and safety…

…by decreasing probability of administering vaccines that are not potent or harmful

Reduce System Cost…

…by decreasing waste due to heat & freeze exposure

…by decreasing cold chain footprint

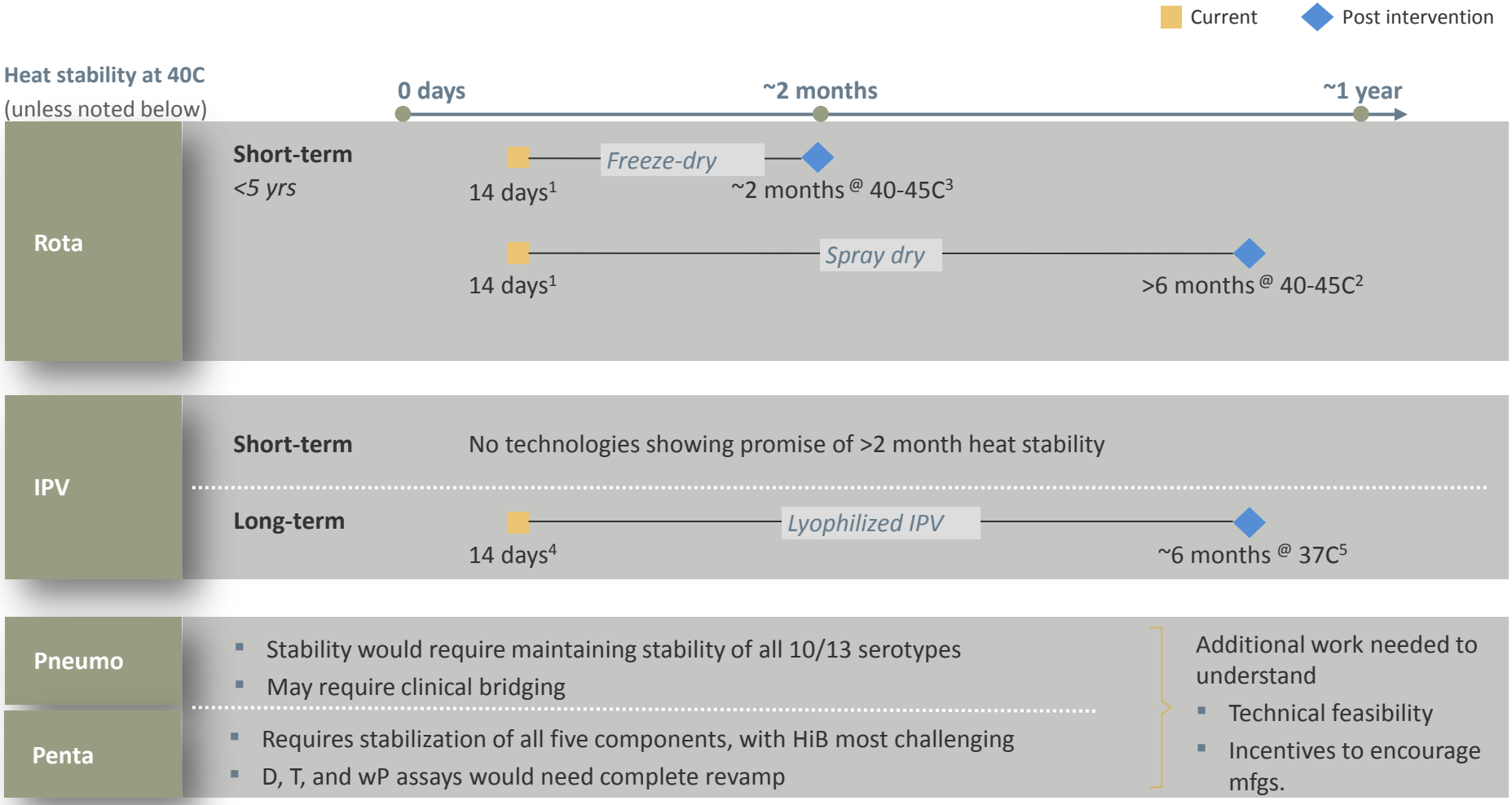
… by reducing cold chain complexity

We have identified and investigated a range of technology options that may offer improved heat stability, including:

NOT EXHAUSTIVE

	Technologies	Details
Re-formulation and labeling	Heat stabilization	Addition of excipients to increase stability of existing vaccines on market
	Re-labeling	No change in formulation; can require clinical trials to create label that reflects Vx thermostability
Drying	Freeze Bulk freeze Spray freeze	Freezing liquid solutions to form more stable dried powders via a lyophilization process (which includes freezing & sublimation)
	Spray	Atomizing liquid solutions and drying droplets via heat to create a more stable powder
	Bubble	Converting solution into micro particles that can be dried through warm carrier gas
	Foam	Forming a dry foam through desiccation under a vacuum and evaporation of solvent
Novel formulations	Microspheres Nanoparticles Microcrystals Silk proteins Sugar glassification	Various types of antigen encapsulation or coating mechanisms to minimize degradation and / or provide thermostability

However these technologies are not applicable to all vaccines



1 Based on Rotarix (GSK); VVM for Rotateq currently unavailable (as of May 24, 2013, WHO)
2 Based on Hilleman Labs spray dry of Rotateq: No loss of potency at 40-45C
3 Based on Hilleman Labs lyo formulation; Potential for additional thermostability with testing
4 Refers to liquid formulation (SSI VVM = 7 days, GSK VVM = 14 days)
5 Six months without loss for type 2 and 3; 10-20% loss for type 1, at 37C; Stand-alone only

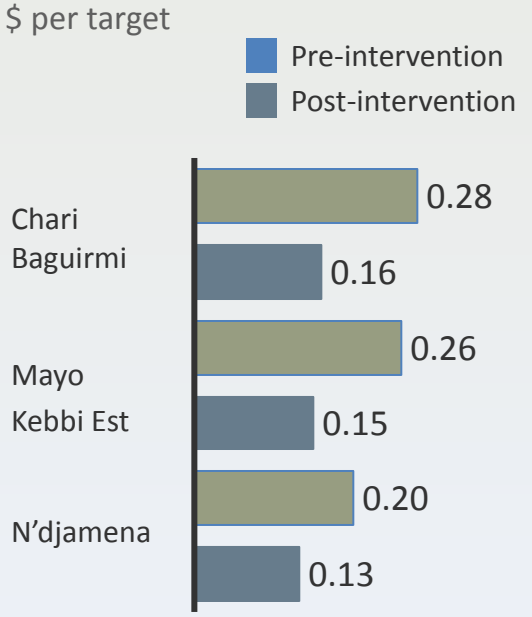
As there are multiple manufacturers of each vaccine, stability improvements would need to be made across the board to ensure good market dynamics

SOURCE: WHO, PATH, expert interviews

Campaign/special strategy vaccines can benefit more easily from thermostability, but more work is needed to unlock this value

35-45% savings projected in Chad due to leverage of a CTC

Modeled savings for MenA campaign by region



- No ice boxes
- Less need for HC workers to "touch base"
- 7 days stability sufficient

Industry collaborations for CTC migration already underway, with opportunity for more

Current Collaborations

- Yellow fever –
- Birth dose HepB
- Cholera –
- HPV –

Proposed Collaborations

- Additional studies to validate existing stability for measles, MR, TT vaccines
- Defining benefits from increasing thermostability of other maternal vaccines (HepB, TT, flu)

A range of other issues also need to be addressed

- Improving **market incentives** to make CTC development an attractive business decision,
- Continuing pilots to **demonstrate benefits of CTC migration** to drive behavior change
- Need for development of a **dual peak/threshold VVM**
- Addressing **regulatory issues** to match product label with actual stability

SOURCE: "Economic benefits of leveraging the true stability of vaccines: The case of Meningitis A in Chad"

Way Forward: Our investments need to be targeted and evidence based

3 priority issues emerge to enable success long-term:

- **Building increased thermostability into the development path for all priority vaccines in development,** to reduce wastage and provide flexibility in in use cases
- **Take advantage of existing thermostability**

- **Making seed investments in proven technologies for specific vaccines** (e.g., rota and IPV) – managed risk;

- **Stay focused on broader immunization coverage and cost effective ways to achieve outcomes – other delivery technologies; cold chain technology** and assess their ability to achieve stability for the full portfolio