Key determinants of biopreparedness

Part II : Treatment and vaccine development

The industry perspective on vaccines : the way forward

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Europe Epidemic Preparedness & Response : Public Private Partnership Joint Metrics of Success *(From CEPI)*

- **Response time** – Defined milestones of safe and effective vaccines ready for scale up at initial stages of outbreaks of epidemic potential
- **Complimentarity** – Effective and well-adjusted to the existing organizational ecosystem
- **Agility & Efficiency** – Proven capacity for rapid scale-up & responsive R&D, streamlined regulatory processes
- **Sustainability** – In both financing & results

Europe Epidemic Preparedness & Response : Public Private Partnership Key Principles for Industry

- **Partnered** : Advanced R&D /IO Devt- Mfg Partnerships
- **Incentivized** : External Funding : Philanthropic – Public/ Hybrid
- **Flexible** : RFPs/PDPs per Phases, Pathogens, Technologies
- **Deliverables Oriented** : Science and Milestones based Work plan
- **Inclusive** : MNC various capabilities /technologies i.e. diversity of business fit
- **Interdependence (Trust based SoI)** vs Independence (Bias /CoI)

Europe Epidemic **Preparedness** PPP Drivers

- Phase : Early : Pre-clinical to Phase I/ Clinical PoP
  Late : Clinical PoP to Phase IIb

- Key Private Sector Players : R&D Driven « End to End » Companies

- P5 Measures to adress gaps (« Push » Public Private Partnership Principles)
  - What : **Public** / ID threats that are relevant to EU (vs WHO/CEPI)
    Early detection and thresholds for Preparedness and Response Phases eg GLOPID-R
    ID Agents Epidemiological, Political Decision Trees e.g. neighboring countries (Turkey/CCHF, Middle East/MERS) , French Overseas territories (Zika)
  - How : **Private** /« P5 Incentives »
    Several RFPs to various R&D Industry Partners to optimize Probability of Success
  - Avoid Du/n -plication
    Need for Interface/Alignment within EU for Private^{n}/Public^{n} Actors eg EMA, WHO (Normative Role) & CEPI (Workplan RFPs & Funding)

Europe Epidemic **Response** PPP Drivers

- Phase : Early : Phase III + M Tech Scale-Up – Limited Stockpiling
  Late : Manufacturing - Industrial Facility – Vaccination Campaigns

- Key Private Sector Players : GMP Quality Driven Companies

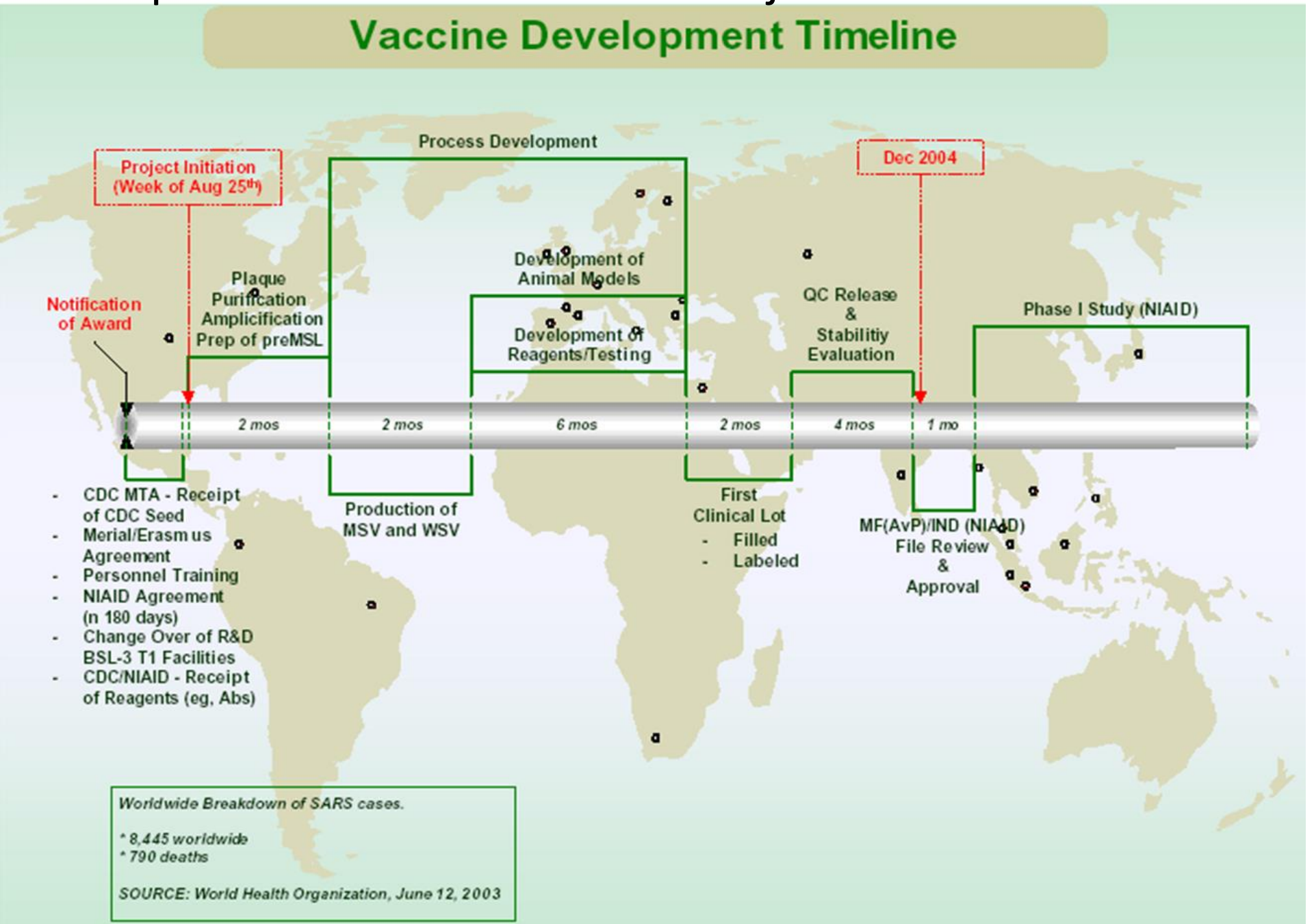
- P6 (Push + Pull) Measures to adress gaps (Costs +++)
  - What : **Public /Private** Manufacturing technology / Industrial Affairs driven

    ID threats /IO technology Platforms eg Vero cell / Live –Inactivated and/or Proteins, mRNA, Adjuvants/Formulations etc.
  - How : **Private** /« P6 Incentives »

    MNC Access Contracts eg Advance Market Commitments, with specified geographies, timelines, Volume /years . Free pricing unless « de-linkage »
  - Avoid Du/n -plication

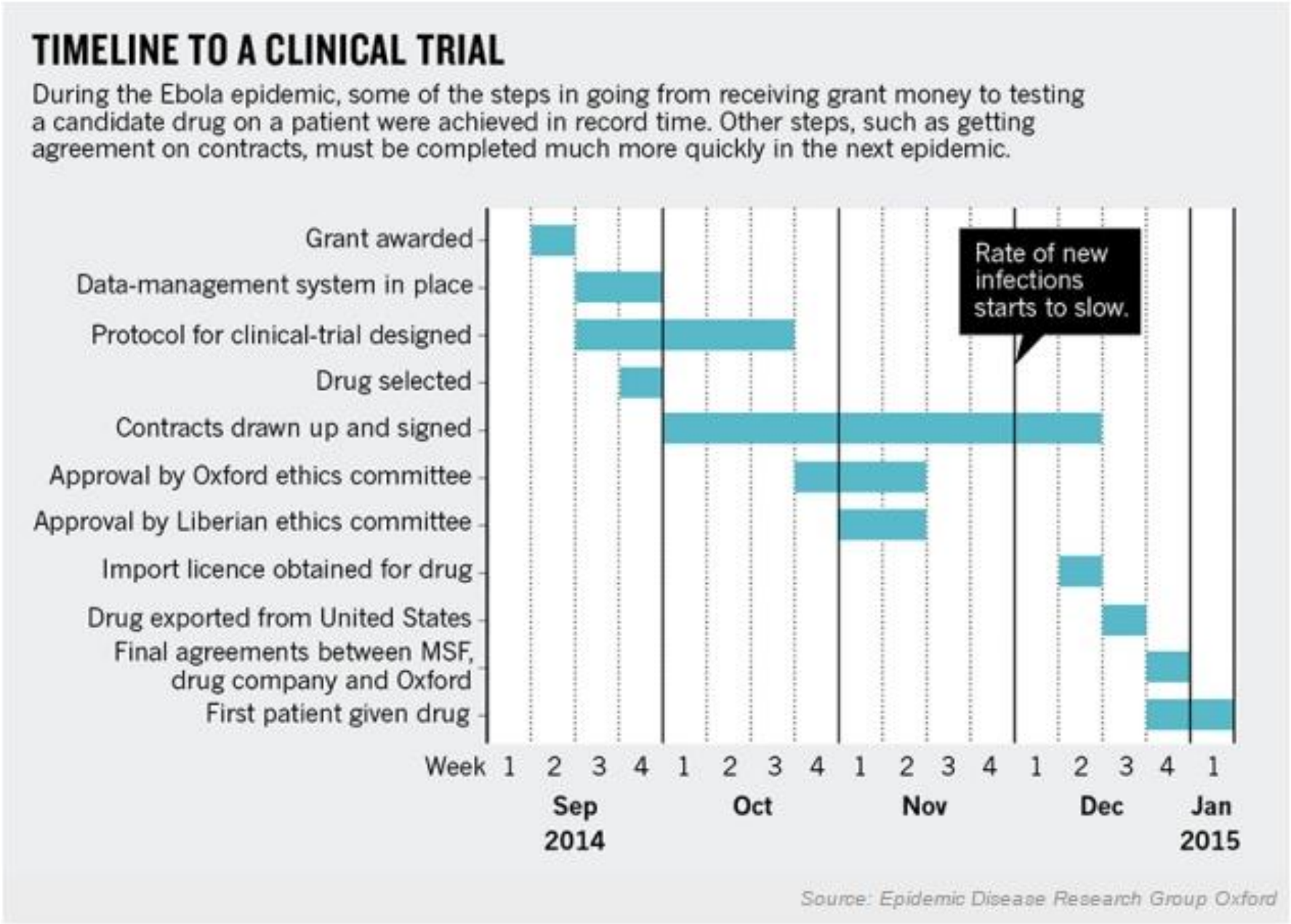
    Need for Interface/Alignment within EU for Privateⁿ/Publicⁿ and Procurement Agencies eg MoHs, GAVI, UNICEF, PAHO

Example 1 : SARS Vaccine from Project initiation to Ph I Lots



Example 2 : Ebola Vaccine Clinical Trial Accelerated Timeline

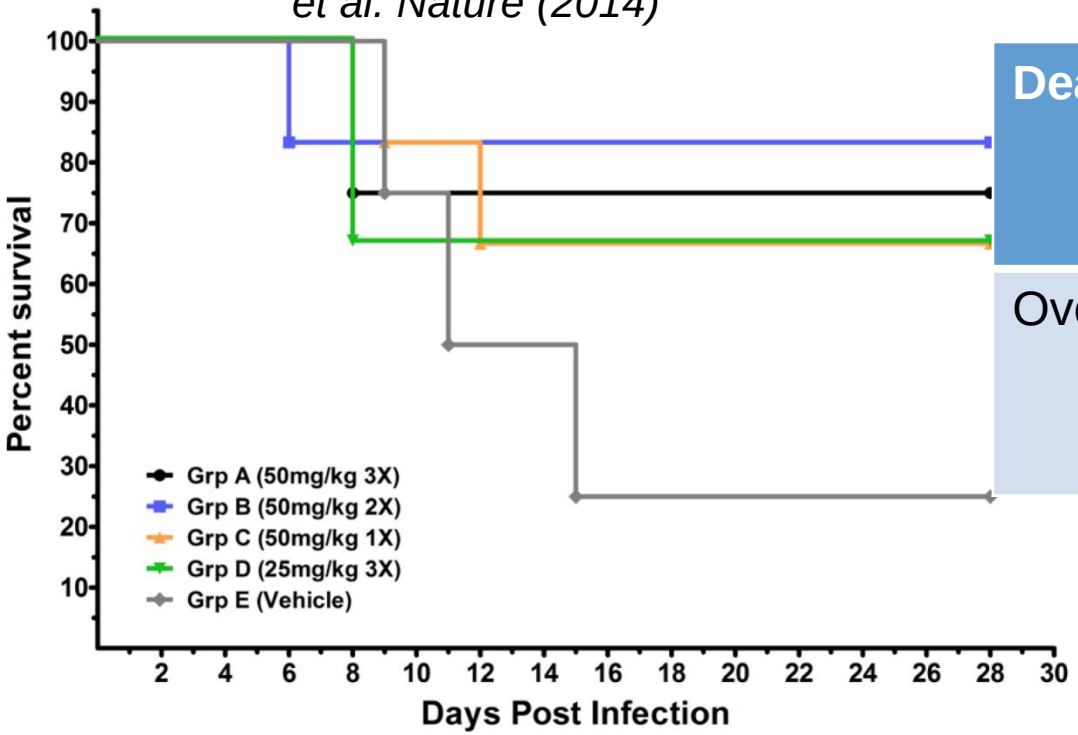
Lang T. Ebola: Embed research in outbreak response. Nature 524, 29–31 (06/08/2015)



Monoclonal Antibodies : Ebola Z Mapp Efficacy Data Example

Preclinical

Reversion of advanced Ebola virus disease in nonhuman primates with Zmapp .Xiangguo Qiu et al. Nature (2014)



Clinical
28 day mortality

Deaths	Total	Control	Treatment
Overall	21/71 29.6%	13/35 37.1%	8/36 22.2 %

Monoclonal Antibodies : Treatment and Prevention of CHIK

CHIKV is an arbovirus transmitted by Aedes vectors
After a week of acute febrile illness, most patients continue to suffer from chronic arthralgia for months to years
There is no curative treatment or vaccine
High healthcare cost and social burden due to affecting young mobile adults

The virus is expected to spread to new areas / New outbreak can lead to over million cases

Collaboration with Vanderbilt University

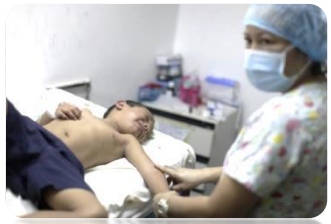
Highly potent human mAb from convalescent patient sera rapidly isolated, assessed, optimized and developed to benefit patients.

Precandidate mAb was identified and showed high potency in in vitro & in vivo pharmacological models.

External partnership with US DoD / DARPA

Candidate nomination and FIH projected respectively in 2Q2017 and 2018

Highly Potent anti CHIKV human mAb with prolonged half life for prevention and treatment of CHIKV disease



Therapeutic cure for CHIKV-associated chronic disease
Prevention of infection in individuals at high risk/post exposure prophylaxis in an epidemic context

Limited SC/IM injections

One drug to limit the impact of acute phase and avoid development of chronicity

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Examples of Public / Private R&D Models to address ID Preparedness & Response for flexible Vaccine Development Capacity

- ❖Global Fund for Vaccine Development
- ❖Coalition for Epidemic Preparedness Innovations (CEPI)
- ❖BARDA Platform initiative

- ❖GSK Global Vaccine R&D Hubs (Italy)

Maryland **BPO** Bio Prep aredness Org :

- B : RD Laboratories
- C : 2 Pilot Plants , GMP Testing, Clinical Immunology
- Administration (throughout)

- ❖Sanofi – IDRI –BMGF **GHVCI** « Global Health Vaccine Center of Innovation »

Current capacity:	5509 sq. meters
	104 scientists (39 PhDs)
	20 admin (3 PhDs)
Expandable to:	7246 sq. meters
(flexible/ USD)	200 scientists

Europe « Pull » PPP Incentives to adress ID Preparedness & Response gaps : Proposals

- Fast track centralized & streamlined Regulatory review
- EU Specialized EU reference expert country /pathogen
- Conditional License based on Phase IIb (Animal Rule ?)
- EU Priority Review Vouchers
- Pharmacovigilance deployment based on e -tools for Vaccination safety follow-up (because of limited licensure clinical data base)
- Creation of a New EU specific fund with a budget x100 MM Euros (Preparedness & Response)
  - Will focus and support the Operational Vaccine Research to Vaccination workplans (through EU RFPs) to be coordinated with CEPI
- Creation of a EU « BARDA like » or EU « IFFIM » like financing facility

Examples of IMI2, H2020 ,EDCTP EU PPPs Focus on non-compete supportive infrastructure & Enabling Tools

- Epidemic detections , Surveillance & Diagnosis
- Preclinical Model /Surrogate Biomarkers
- Clinical Trial Networks/Efficacy Stat Modelling (R0 understanding)
- Regulatory Licensure
- Post licensure effectiveness
- Pharmacovigilance ad-hoc Processes
- Patients Engagement ie mitigate Vaccine Hesitancy

Thank You !

- **Interdependence : Trust based Sharing of Interests**