



United States Department of

Health & Human Services

Office of the Assistant Secretary for Preparedness and Response (ASPR)



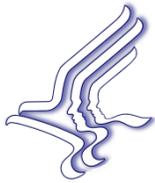
BARDA Programs to Foster Technological Innovation

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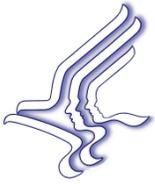
June 9, 2011



How Does BARDA Support Technology Innovation?



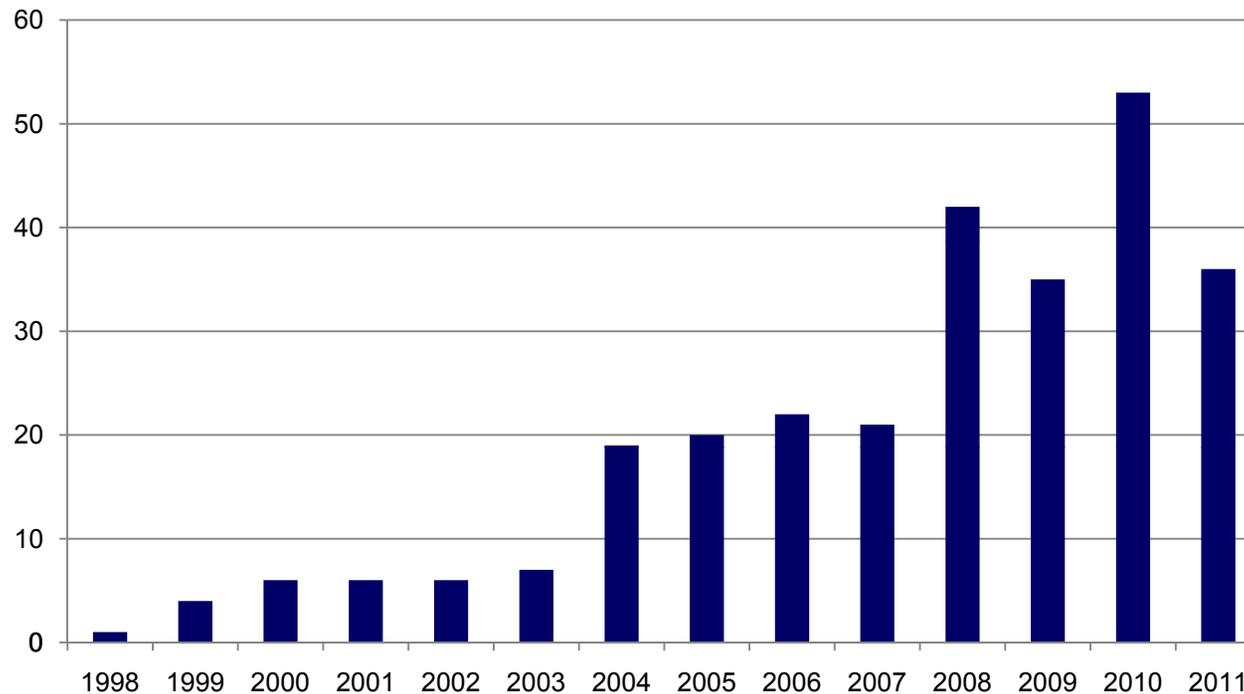
- **Intramural Research Projects**
 - Multiple projects per year for FDA and CDC laboratories
 - Program dates back to 2005
- **Workshops**
 - Organized and sponsored “Mechanisms of Lung Injury and Immunomodulator Interventions in Influenza” workshop March 2010
 - In conjunction with 2010 Gordon Research Conference “Biology of Acute Respiratory Infection”
- **Extramural Research Projects**
 - “Science and Technology Platforms Applied to Medical Countermeasure Development” BAA published July 8, 2009, reissued January 1, 2011 (BARDA-BAA-11-100-SOL-00001)
 - FedBizOps (www.fbo.gov) keyword search “BARDA”
 - Links through www.medicalcountermeasures.gov



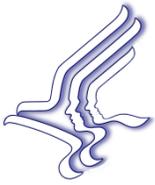
Use of the Term “Platform Technology” has Increased in the Literature



Results in PubMed Search



- **Publications in *Nanotechnology, Chirality, Expert Opinion on Drug Delivery, Biomaterials, Vaccine, etc.***



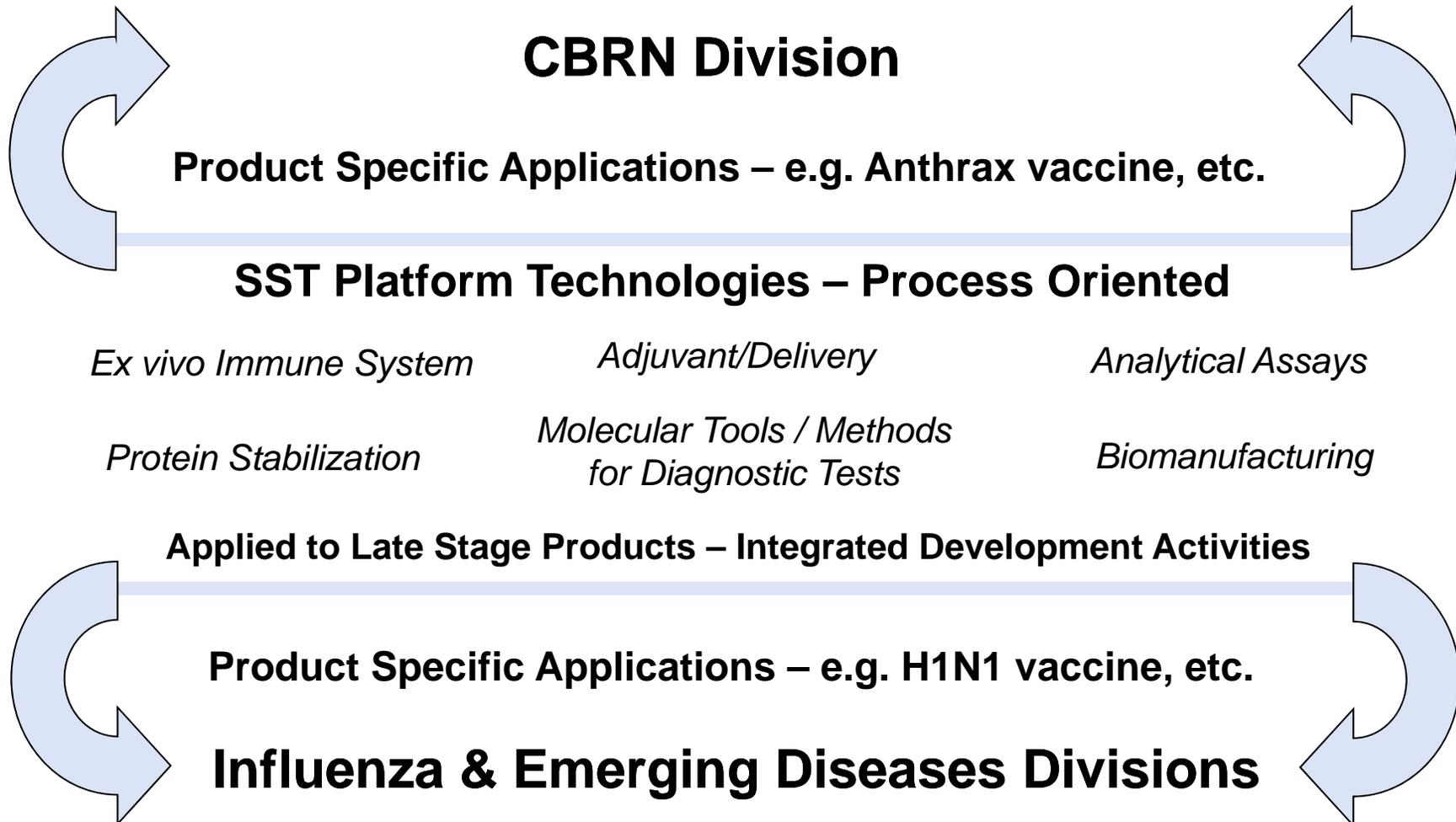
Innovation – What are the guidelines?



<http://www.cartoonbank.com/2005/ill-be-happy-to-give-you-innovative-thinking-what-are-the-guidelines/inv/129140/>



Platform Technologies and Applications

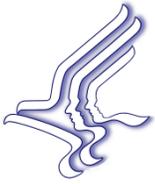




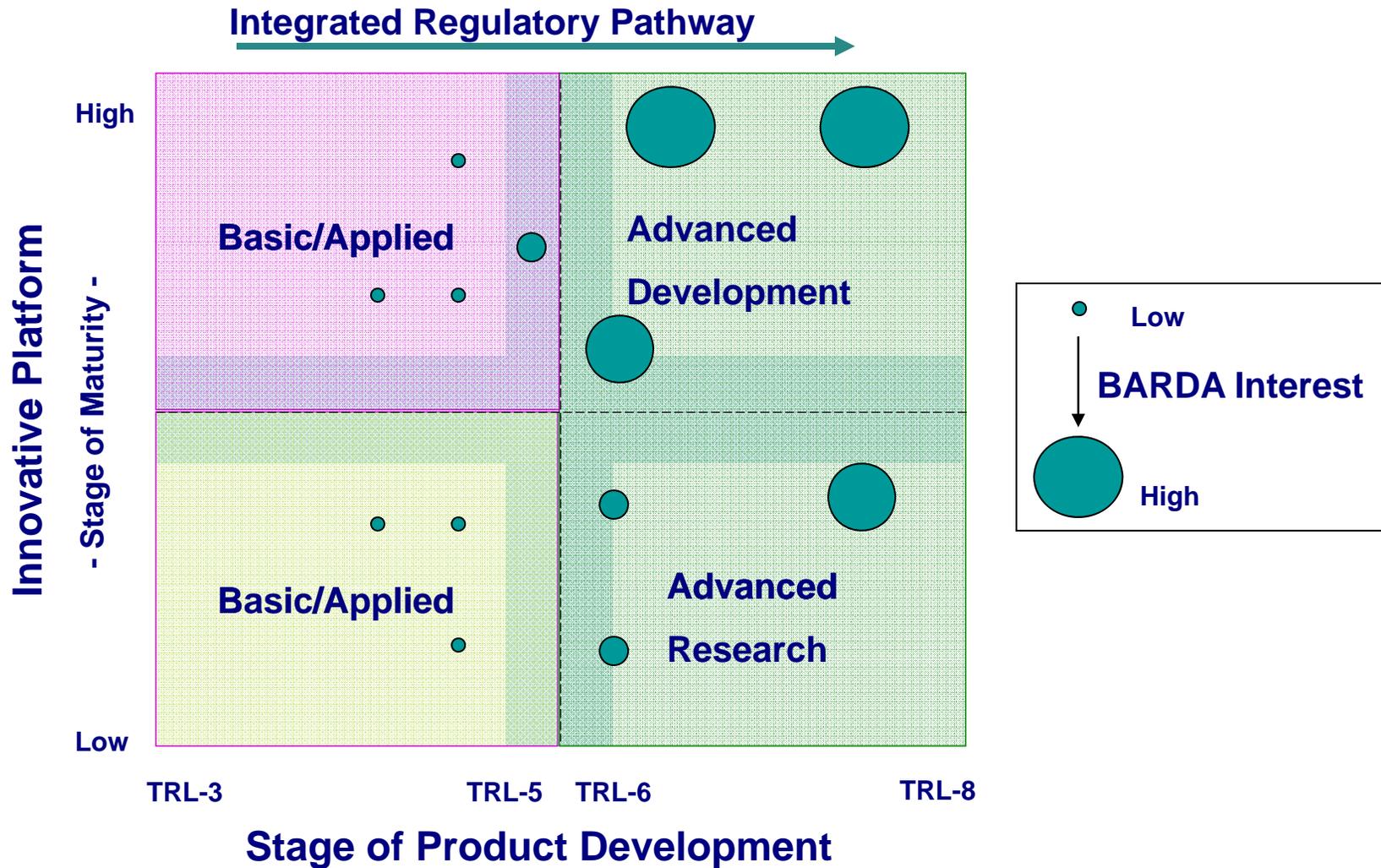
SST BAA Areas of Interest

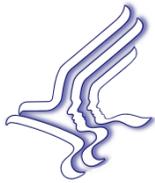


- **SST Area of Interest #1: Technologies to accelerate evaluation of candidate vaccines and therapeutics**
- **SST Area of Interest #2: Formulation chemistry, protein stabilization, and vaccine delivery technologies**
- **SST Area of Interest #3: Innovative methods in bioprocess development and manufacturing**
- **SST Area of Interest #4: Methods and technologies to advance development of tests for rapid diagnosis of human injury and infections**



BARDA Interest: Stage of Platform Technology and Product Development





Accelerating Vaccine and Therapeutic Evaluation



- **Technology**

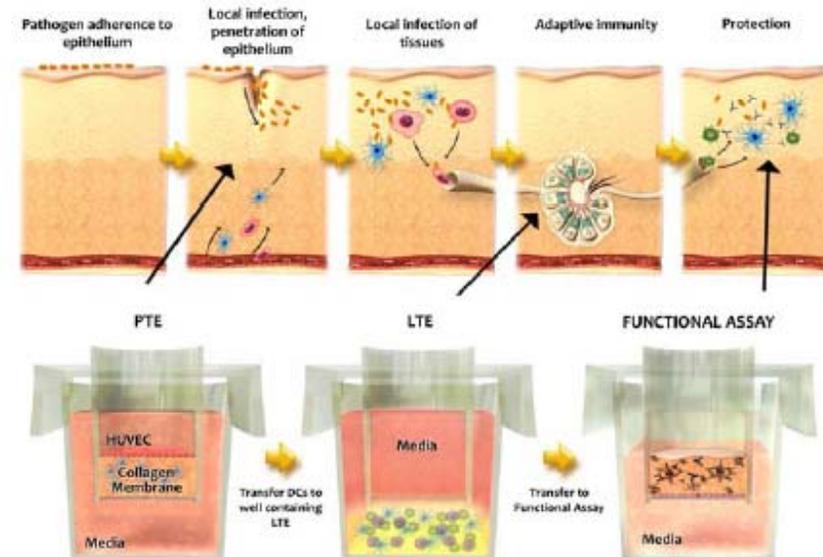
- MIMIC® (Modular IMMune In vitro Construct) models both the innate and adaptive immune responses through 2 modules

- **Maturity and Project Scope**

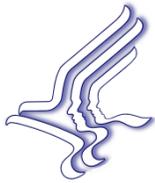
- MIMIC® has been evaluated with commercial vaccines – Influenza and Yellow Fever
- Further development and verification that the in vitro system is correlated to in vivo response

- **Application to BARDA's mission**

- MIMIC® may greatly accelerate evaluation of candidate vaccines and reduce dependence on animals
- System would apply to biodefense, influenza, and emerging diseases
- Platform potential extends to many aspects of product development (e.g. formulation) and applies to vaccines and therapeutics



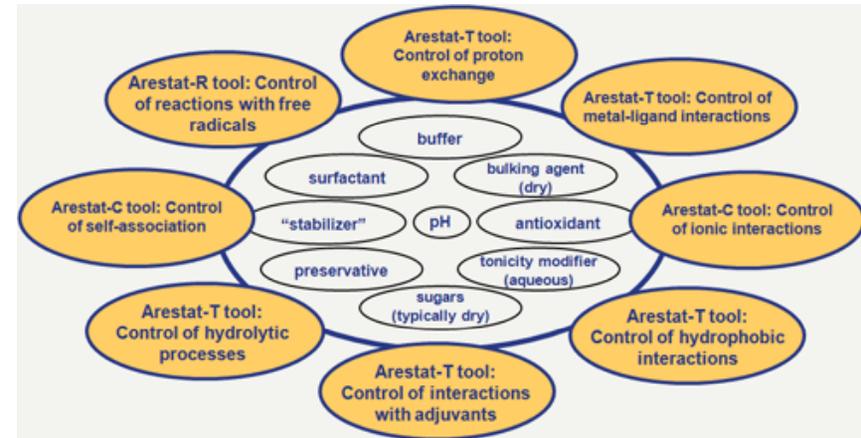
<http://www.vaxdesign.com/mimic-technology>



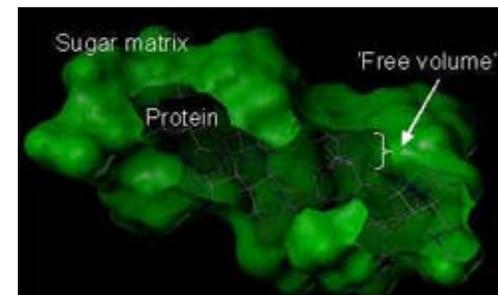
Improved Stability of Influenza Vaccines



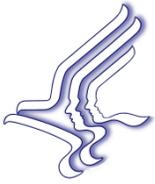
- **Technology**
 - PATH coordinated team for liquid (Arecor) and dried (Aridis) formulation strategies
- **Maturity and Project Scope**
 - Both technologies have been applied to products used in clinical development for commercial applications
 - Both technologies will be applied to subunit and live attenuated influenza vaccines (2009 H1N1) and subsequently to a second strain to demonstrate robustness
 - Formulation and pre-clinical studies
- **Application to BARDA's mission**
 - Technologies address an immediate for improved stockpiled flu vaccine stability (especially live)
 - Impact to BARDA's international program by reducing cold-chain requirements
 - Both technologies would be broadly applicable to bioterror and emerging disease candidate biologicals



<http://www.arecor.com/arestattech.aspx>



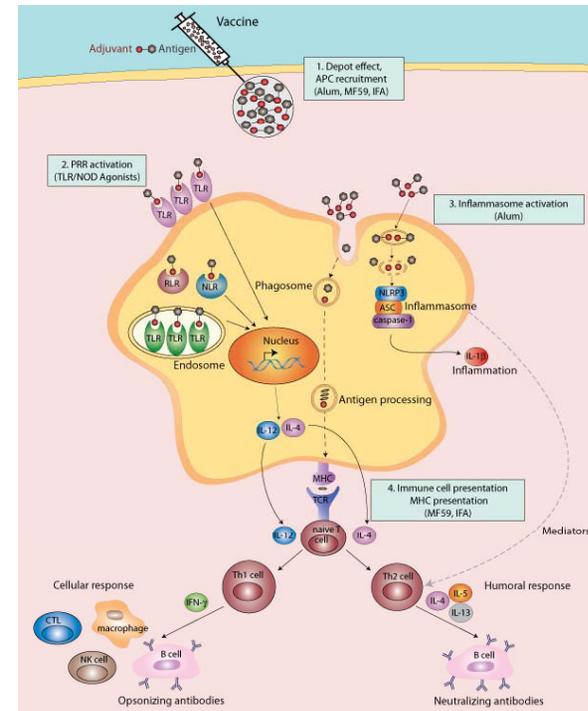
<http://www.aridispharma.com/stabilizationofbiopharma.html>



Adjuvants



- **Technology**
 - IDRI's stable emulsions combined with GLA TLR4 agonist represent emerging adjuvant candidates
- **Maturity and Project Scope**
 - GLA-SE has entered clinical evaluation with multiple late stage products
 - Adjuvant technologies will be evaluated with other TLR agonists and emulsion formulations to evaluate a toolbox to tailor the immune response to the needs of a particular pathogen
 - Formulation and pre-clinical studies with influenza vaccines
- **Application to BARDA's mission**
 - Dose- and dosage-sparing are immediate needs in influenza
 - Applicable to current and future biodefense, influenza, and emerging disease requirements



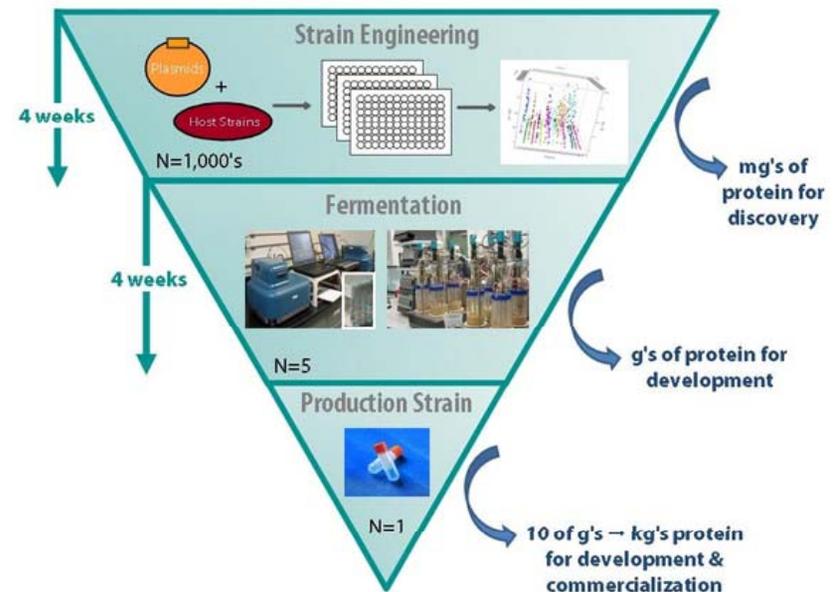
http://www.invivogen.com/family.php?ID=291&ID_cat=14&ID_sscat=121



Protein Expression



- **Technology**
 - Pfenex's *Pseudomonas fluorescens* protein engineering uses high throughput strain development and screening for efficient production of soluble protein
- **Maturity and Scope of Work**
 - *P. fluorescens* expression platform has successfully produced protein used in clinical development of commercial products
 - Pfenex is demonstrating through strain development and pre-clinical studies the capability to produce rPA as a candidate anthrax vaccine
- **Application to BARDA's mission**
 - *P. fluorescens* expression system is a platform technology capable of producing proteins that are unsuccessfully produced in other expression systems
 - Supplementing the anthrax vaccine program's product pipeline



<http://www.pfenex.com/page/platform-technology>



Influenza Manufacturing Platforms

- **Technology**

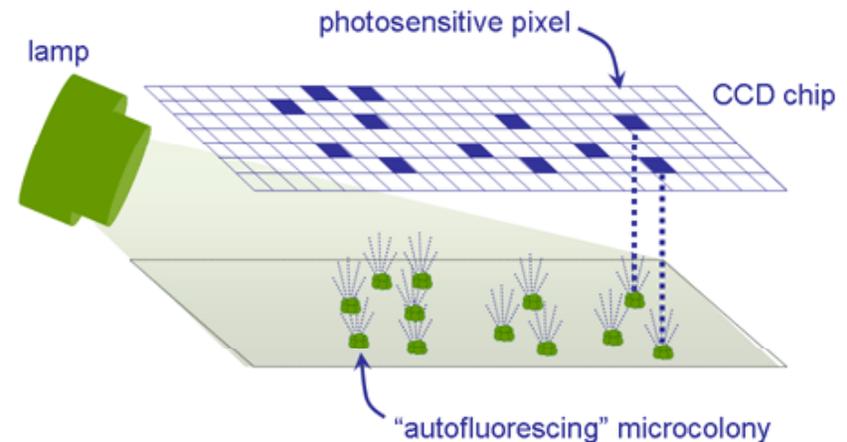
- Rapid Micro Biosystems' Growth Direct System (GDS) for rapid sterility testing takes advantage of cell auto-fluorescence to rapidly detect contaminating cell growth
- Novartis's flu vaccine manufacturing and J Craig Venter Institute's gene synthesis capabilities

- **Maturity and Scope of Work**

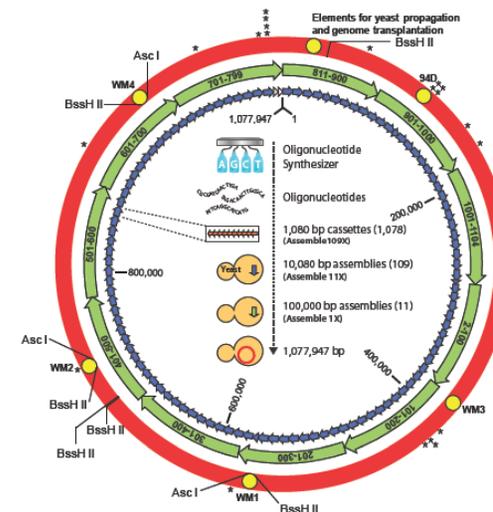
- GDS is commercially available technology for bioburden screening being developed and optimized for rapid sterility testing
- Influenza seed viruses fit into nearly all egg- and cell-based vaccine products

- **Application to BARDA's Mission**

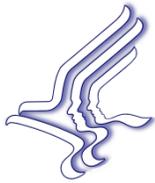
- Reducing sterility testing assay time to < 14 days and reducing virus reassortant processes will greatly accelerate vaccine release
- Platform technologies applicable to other parenterals and virus-based products



<http://www.rapidmicrobio.com/growth-direct/technology/>



From Gibson, D. G., J. I. Glass, *et al.* 2010. Creation of a bacterial cell controlled by a chemically synthesized genome. *Science*, Published online May 20 2010.



Summary of Existing Innovations Portfolio



- **Projects accomplish many objectives**
 - Evaluating and supporting further development of platform technologies
 - Supporting earlier development to expand product pipeline for CBRN and Influenza
 - Addressing critical mission goals such as flu manufacturing and BARDA's international program
 - Typical 2-3 year timelines allows fluidity to rotate in new technologies as existing projects mature and transition
- **Innovation capitalizes on established infrastructure**
 - Formulations designed to streamline into existing manufacturing processes
 - Biomanufacturing improvements are compatible with existing infrastructure (e.g. fermentation facilities)
 - I.e. innovation doesn't require a complete restructuring of the entire MCM infrastructure



Further Thoughts

- **Most projects applied to influenza vaccine**
 - Easier system to evaluate technologies due to licensed products with historical data and established assays and animal models
 - Application to other pathogens is applicable
- **Represented Technologies**
 - Adjuvants and protein stabilization
 - Expression and influenza vaccine manufacturing
 - Diagnostics
- **Underrepresented Technologies**
 - Formulations for alternate delivery
 - Accelerated vaccine and therapeutic design
 - Other technologies in the future?



Questions?