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biosciences

Assembly Biosciences Jefferies 2015 Microbiome Summit

December 16, 2015

Forward-Looking Statements



This presentation contains forward-looking statements regarding future events. Forward-looking statements involve known and unknown risks that could cause actual results to differ materially from expected results. These risks and uncertainties include, among others: risks related to the scientific bases, costs, timing, regulatory review and results of our studies and clinical trials; our ability to obtain FDA and other regulatory approval of our product candidates; our anticipated capital expenditures, our estimates regarding our capital requirements, and our need for future capital; the unpredictability of the size of the markets for, and market acceptance of, any of our product candidates; our ability to sell any approved products and the price we are able to realize; our ability to obtain future funding on acceptable terms; our ability to retain and hire necessary employees and to staff our operations appropriately; our ability to compete in our industry and innovation by our competitors; our ability to stay abreast of and comply with new or modified laws and regulations that currently apply or become applicable to our business; and the risks set out in our filings with the SEC.

Investment Highlights



Building a Integrated, Infectious Disease Company

Focus on Infectious Diseases

- Direct-acting antivirals for Hepatitis B (HBV) and microbiome therapies for *C. difficile* infection (CDI)
 - (HBV) No functional cure
 - (CDI) One of the most common hospital-acquired infections with high cost of treatment

Significant Market Opportunity and Unmet Need

- (HBV) Nearly 350 million chronically infected patients worldwide
- (CDI) 500,000 contract the disease each year, 77% higher chance of being readmitted within 30 days, 55% longer hospital stay & 13% higher risk of mortality

Proprietary Technologies and Scientific Expertise

- (HBV) Focused on developing novel therapies with curative potential
- (CDI) Microbiome-based with a differentiated discovery platform leveraging proprietary bacterial strain library and oral capsule GEMICEL™ targeted-colon delivery technology

World Class Team

- Experienced management team and Board with deep industry experience
- Renowned thought leaders in drug discovery, development and delivery



HBV-Cure Pipeline: Progressing on Track

	HBV Lifecycle Modulation		Current and Planned Development				
Program	"Downstream" Inhibit HBV Replication	"Upstream" Modulating cccDNA	Research	Hits	Lead Optimization	IND Enabling	Clinical Development
ASMB-101 CpAM Capsid Targeted	● ● ●	●	Current				
ASMB-102 CpAM Upstream Mechanism	● ●	● ●	2016 - 2017				
ASMB-103 CpAM Upstream Mechanism	●	● ● ●					
ASMB CpAM (Gen 2) Second generation	To Be Selected						
Novel HBV Targets (Confidential)	To Be Selected						

Clinical Strategy – CpAM Monotherapy and Combinations

- We are on track with selection of our first lead and expect to be in the clinic H2 2016
- Through 2017 we expect to have multiple molecules in clinical trials and some going through lead optimization and/or IND enabling toxicology
- Goal remains to develop multiple novel complementary direct-acting antiviral mechanisms for combination studies

Microbiome: Explosion In Research In Last 5 Yrs



 The NEW ENGLAND JOURNAL of MEDICINE

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EDITORIAL

Fecal Microbiota Transplantation — An Old Therapy Comes of Age

Ciarán P. Kelly, M.D.
N Engl J Med 2013; 368:474–475 | January 31, 2013 | DOI: 10.1056/NEJMe1214816

Stool substitute transplant therapy for the eradication of *Clostridium difficile* infection: 'RePOOPulating' the gut

Elaine O Petrof^{1*}, Gregory B Gloor^{2†}, Stephen J Vanner¹, Scott J Weese³, David Carter⁴, Michelle C Daigneault⁵, Eric M Brown⁵, Kathleen Schroeter⁵ and Emma Allen-Vercoe⁵

 Journal of HOSPITAL MEDICINE www.journalofhospitalmedicine.com

REVIEWS

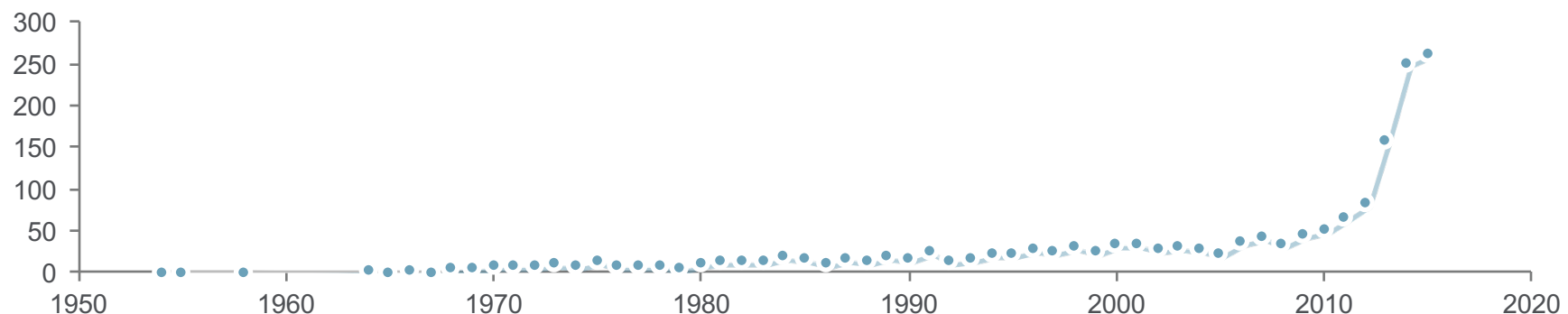
Fecal Microbiota Transplantation for the Treatment of *Clostridium difficile* Infection

Krishna Rao, MD^{1,2}, Nasia Safdar, MD, PhD^{3*}

Administration of Spores of Nontoxigenic *Clostridium difficile* Strain M3 for Prevention of Recurrent *C difficile* Infection: A Randomized Clinical Trial

Dale N. Gerding, MD; Thomas Meyer, MD; Christine Lee, MD; Stuart H. Cohen, MD; Uma K. Murthy, MD; Andre Poirier, MD, MSc; Trevor C. Van Schooneveld, MD; Darrell S. Pardi, MD, MS; Antonio Ramos, MD; Michelle A. Barron, MD; Hongzi Chen, PhD; Stephen Villano, MD

Pubmed – FMT Article Count





FMT Works, But Better Approach Needed

Why do concerns persist for FMT?

- FMT is a true transplant of human derived biological material
- Risks of infection transmission can't be fully resolved
- Poor patient and health care worker acceptance
 - “...**you want to put.... *WHAT into me?***”
- Batch to batch consistency is not reliable

Solution:

‘Synthetic’ bacteriotherapy with selected subset of commensal organisms grown in pure culture that recapitulate the effect of FMT



Assembly's Solution: 'Druggable' Microbes

Replace FMT therapy with a 'synthetic' bacteriotherapy

What success looks like: replacing FMT

- An oral “biologic” pill which meets or exceeds FMT response in rCDI
- Consistent cGMP product
- GEMICEL targeted delivery of vegetative microbes & spores to the colon

Product Expansion

- Bacteria strain library and GEMICEL allow subsequent application to additional microbiome/dysbiosis related conditions including:
 - Primary CDI
 - Other infectious disease
 - Inflammatory Bowel Disease (IBS)
 - Metabolic disease
 - Other indications

Solution: GEMICEL™ Formulation



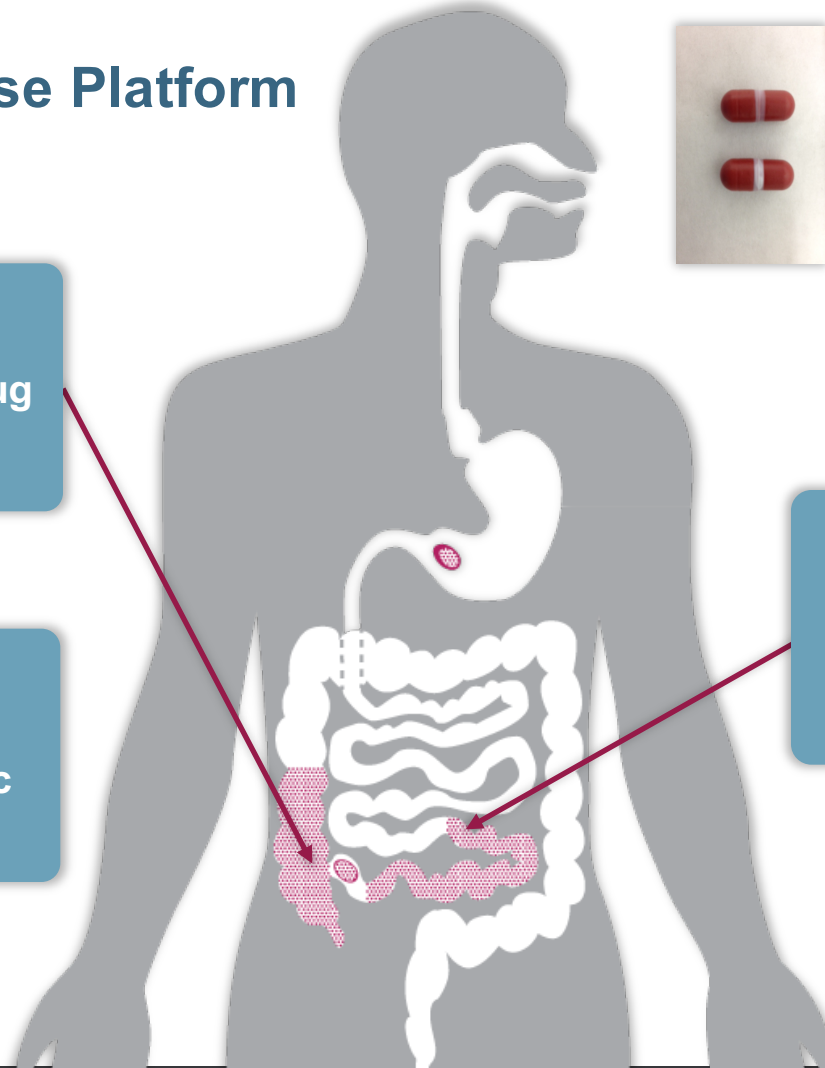
Targeted delivery technology enables direct treatment to the colon

Controlled Release Platform

Second Inner Coated
for bolus release of drug
A in right colon

- GRAS ingredients
- Manufacturing amenable to biologic products

First Outer Coated
for bolus release of drug A in Ileum

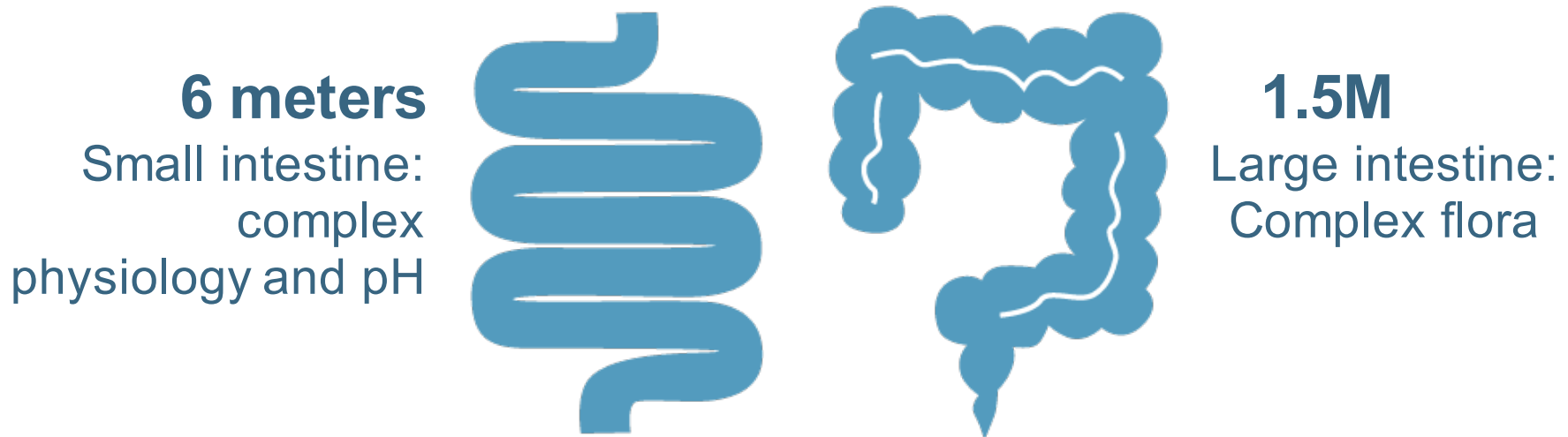




Targeted Delivery: Why Is It So Important?

Targeted delivery technology enables direct treatment to the colon

- GI tract has number of defenses and makes bacterial colonization challenging



Despite challenges, the colon is an attractive site for oral drug delivery – and especially for microbiome delivery IF it can be reliably delivered in bolus

Assembly Biosciences AB-M101



AB-M101 is a potential best-in-class therapy for the treatment of rCDI

Initial goal: A cure for rCDI by merging key findings of our collaborations, internal discovery and proprietary colonic delivery technology, Gemicel™

- **Efficacy:** Administered as an oral pill, AB-M101 will incorporate specific strains of vegetative bacteria, and is intended to achieve similar efficacy and safety as FMT in the treatment of rCDI
 - FMT consists of both vegetative bacteria and spores
 - We believe that a therapy including spore formers and vegetative bacteria, delivered specifically to lower GI, can potentially be more reliably effective than a treatment with spores alone
- **Regulatory/cGMP:** Scalable, cost efficient, reliable and consistent manufacturing
- **Patient Preference:** Oral treatment with dosing flexibility provides a better chance of efficacy/non-recurrence



Making Bacteria ‘Druggable’

Rigorous scientific development engine for bacterial therapy selection

Strain Selection

Proprietary strain selection methodologies:

- Human FMT studies
- Scientifically rigorous sequencing and analysis including machine based algorithms
- *in vitro* and *in vivo* models

Development / Manufacturing

Systems that assure proper design, monitoring, and control; selected strains require:

- Isolation
- Development of appropriate culture media & cultivation conditions
- GMP cell banking of pure strains
- GMP production of bulk material
- Scale up

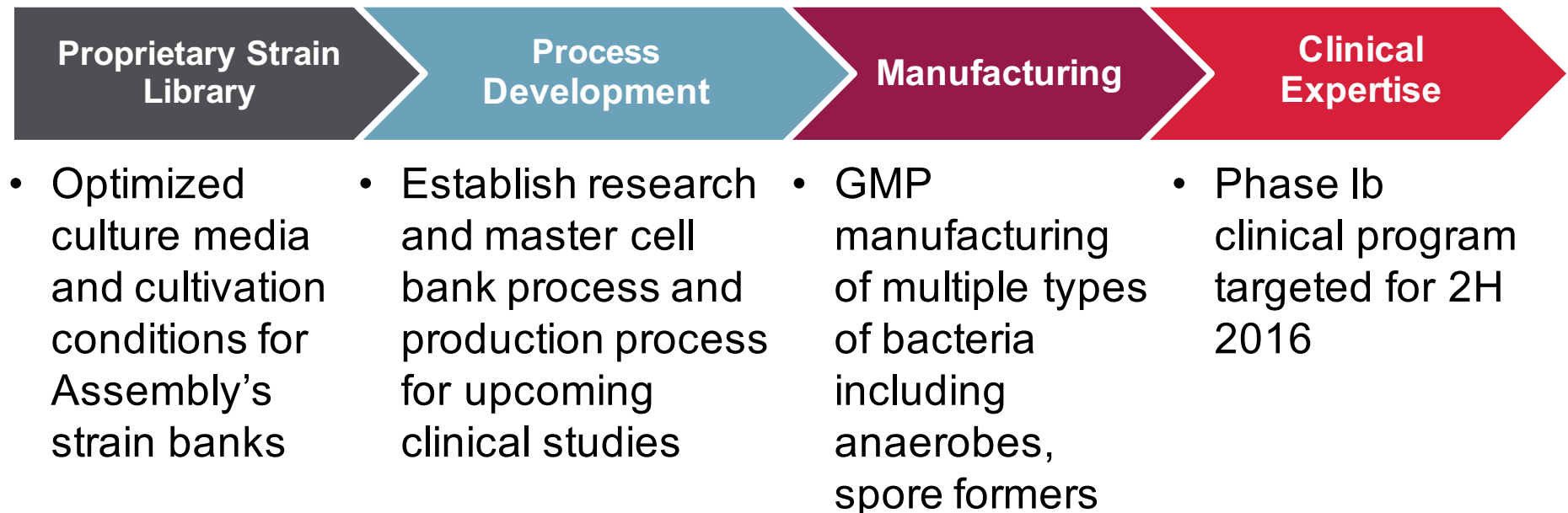
Targeted Delivery

- **GEMICEL™** enables reliable targeted delivery of otherwise “undeliverable” microbes
- Flexibility for single or multi day regimens to optimize efficacy across multiple indications

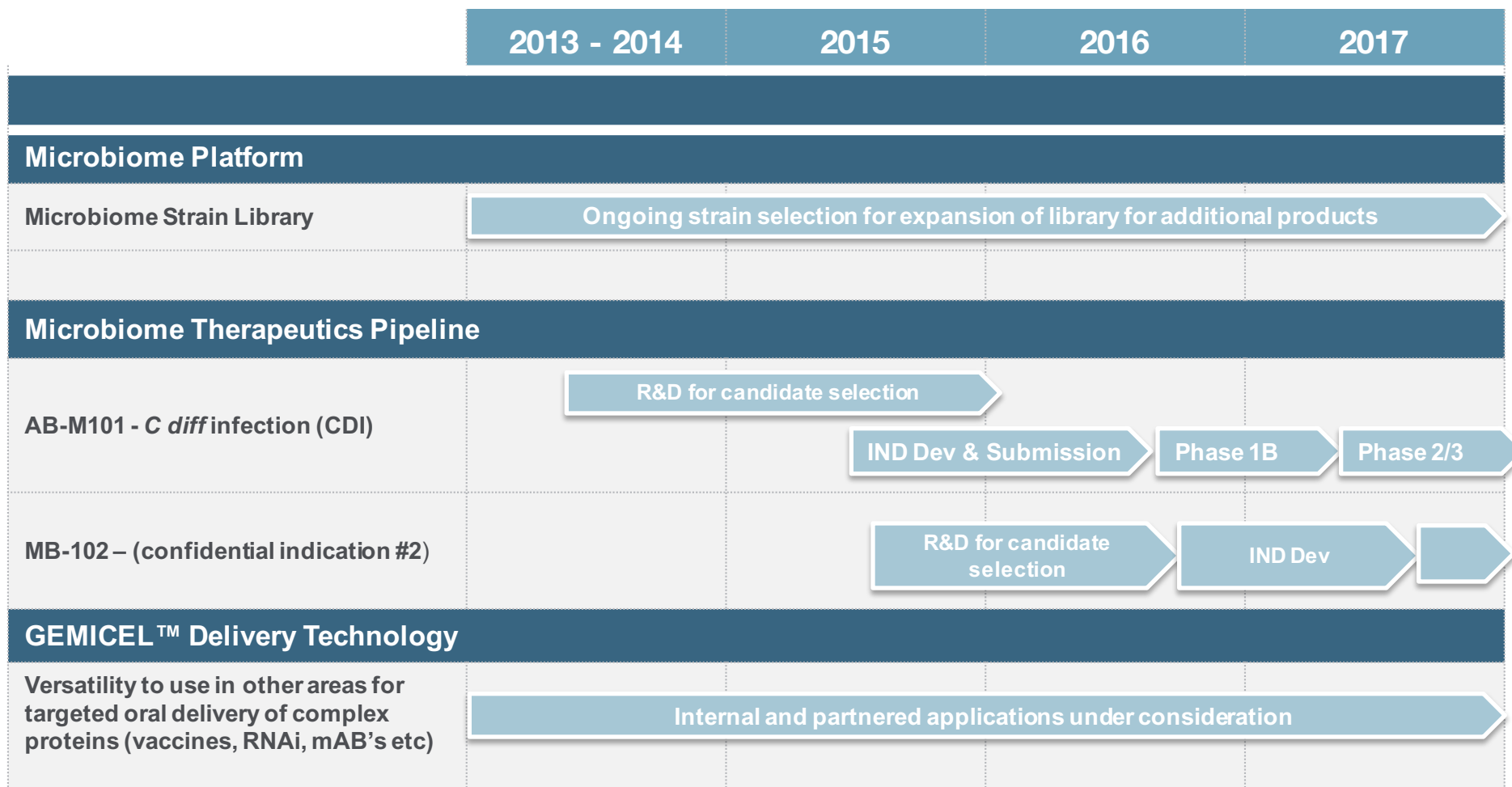
Integrated Discovery & Manufacturing Engine



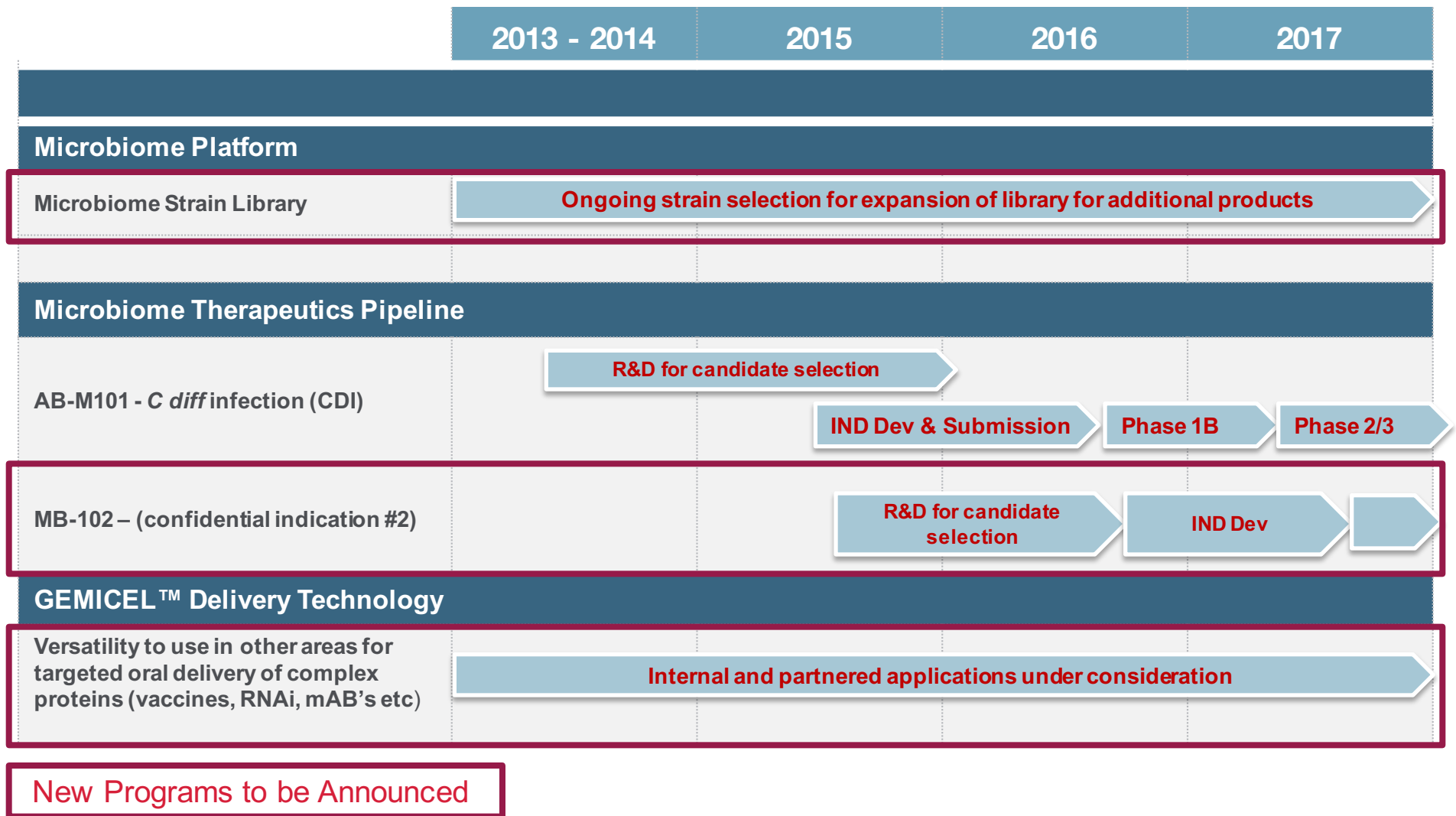
Assembly's microbiome platform creates opportunities for expansion



Microbiome Pipeline Progress



Microbiome Pipeline Progress





Summary

- **HBV Platform:** On track, additional updates forthcoming in 2016
- **Microbiome Platform:** Developing cGMP oral biologic products
 1. Rigorous scientific development engine for bacterial selection
 2. Selected subset of organisms; both anaerobes, spore formers
 3. Consistent cGMP manufacturing
 4. Targeted delivery technology enables reliable, consistent, oral delivery to colon
- Phase Ib for rCDI targeted to begin in 2H-2016
- Gemicel™ and our microbiome R&D engine provide for rapid and streamlined disease area expansion – plans in progress



Thank You