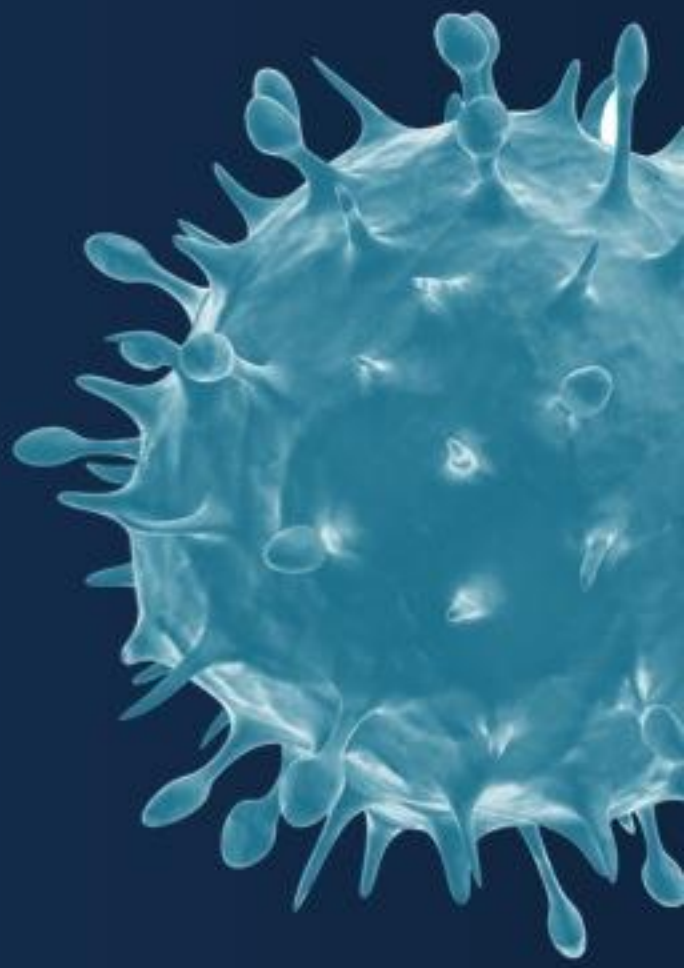
Positive Viral Shedding Efficacy Results



GEN-003 Immunotherapy for Genital Herpes

Phase 2b Study

September 29, 2016

genocea BIOSCIENCES

Safe Harbor Statement

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You may get copies of our Annual Report on Form 10-K, Quarterly Report on Form 10-Q and our other SEC filings for free by visiting EDGAR on the SEC website at http://www.sec.gov.

Highlights

- 60 µg per protein / 50 µg of Matrix-M2 adjuvant dose hit primary clinical trial endpoint
  - 40% viral shedding rate reduction consistent with prior trial
- Safety profile acceptable
  - Low discontinuation rates due to AEs; distributed across dose groups, including placebo
  - No grade 4 reactogenicity or related AEs
- GEN-003 on track for 2H 2017 Phase 3 start
  - Phase 2b 6 month clinical efficacy data expected: January 2017
  - FDA end of Phase 2 meeting expected: Q1 2017
  - Phase 2 antiviral combination study start expected: Q4 2016

Agenda for Today's Call

- Market potential for GEN-003
- Phase 2b trial
  - Study design
  - Top line data
- Physician perspective – Lori A. Panther, MD, MPH
- Important 2017 clinical and regulatory milestones
- Conclusions
- Q&A

The Need for New Genital Herpes Treatments Drives Large Market Opportunity

- Genital herpes characterized by viral shedding, leading to disease transmission and genital lesions

- Oral antiviral therapy insufficient for millions
  - Viral shedding reduced only when patients are taking medication but most use episodically
  - Lesions still occur even on chronic therapy

- GEN-003 designed using ATLAS to direct T and B cells to fight clinical disease by reducing viral activity

- GEN-003 product profile drives revenue opportunity of >$1bn in U.S. alone*

*Based on Genocea-sponsored market research

Phase 2b Trial Goals and Objectives

- Overall goal
  - Select dose of Phase 3-ready formulation of GEN-003 for Phase 3 trials
- Primary endpoint
  - Compare efficacy versus baseline of two dose levels of GEN-003 and placebo by impact on viral shedding
- Secondary objectives
  - Evaluate impact on clinical disease versus placebo at 6 and 12 months[(a)]
    - Proportion recurrence free
    - Time to next recurrence
    - Lesion rates
  - Safety and tolerability
  - Immunogenicity[(a)]

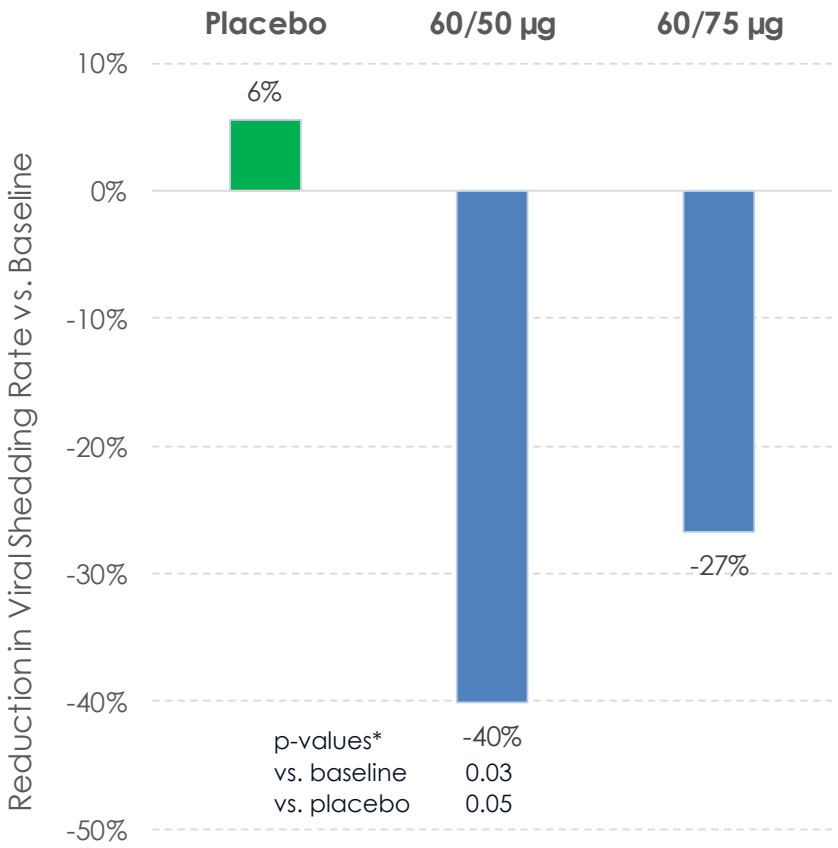
(a) Not part of top-line read-out

Study Design

- Randomized, double-blind, placebo-controlled
- 131 subjects with a history of recurrent genital herpes
- 3 dose groups, followed for 12 months
  - Placebo (n=44)
  - 60 µg per protein / 50 µg of Matrix-M2 (n=43)
  - 60 µg per protein / 75 µg of Matrix-M2 (n=44)
- Consistent with prior trials
  - Inclusion / exclusion criteria, demographics, sites, dose regimen, endpoints, observation periods, swabbing compliance

Statistically Significant 40% Viral Shedding Rate Reduction for 60 / 50 µg Dose

Viral Shedding Rate Reduction by Dose Group



*Poisson model analysis (refined since prior Phase 2 trial with reference to advances in the field: Magaret, Amalia, "Models for HSV shedding must account for two levels of overdispersion" (January 2016). UW Biostatistics Working Paper Series. Working Paper 410. http://biostats.bepress.com/uwbiostat/paper410)

- In prior Phase 2, this antiviral efficacy increased to 66% at 12 months; led to significant and durable clinical efficacy at 6 & 12 months
- 60 / 75 µg dose showed a 27% reduction vs. baseline (not significant)
- Robust control arm in placebo group

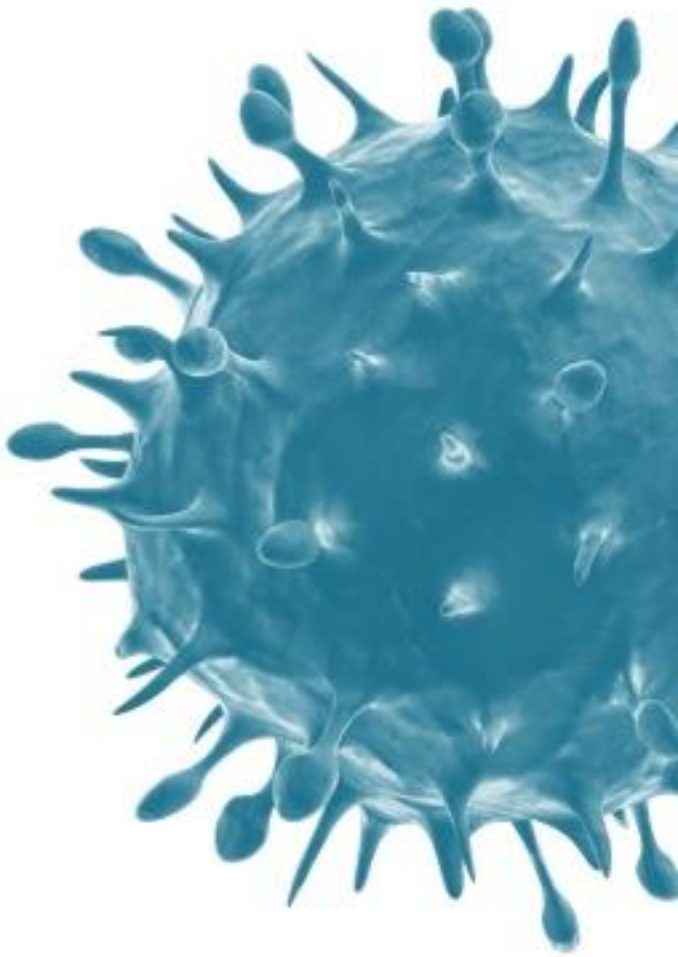
Overall Summary of Safety

- Safety continuously reviewed by Independent Data Safety Monitoring Board
- Low discontinuation rate due to AEs; similarly distributed across dose groups including placebo
- Reactogenicity consistent between 2 trials for 60 µg /50 µg dose
- No grade 4 reactogenicity or related SAEs in either this trial or prior Phase 2 trial

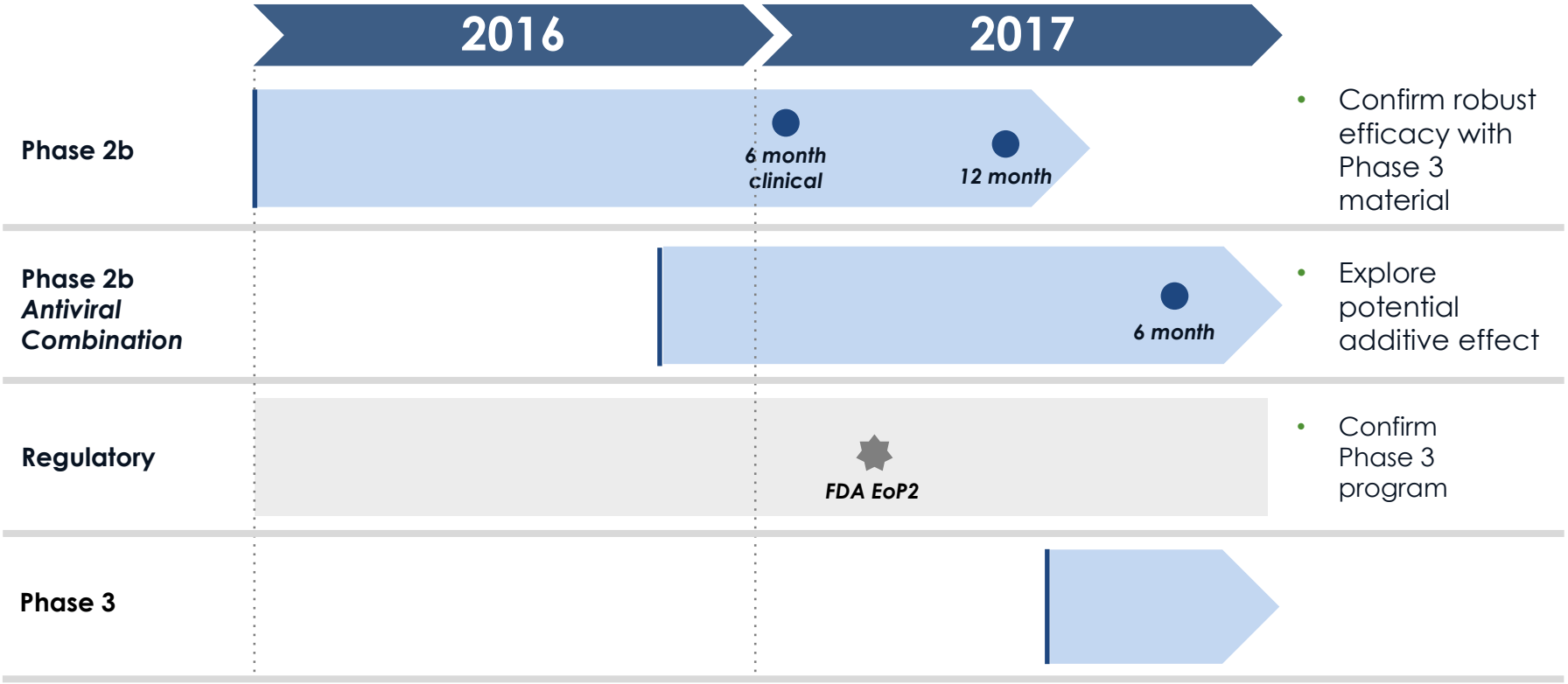
GEN-003 Physician Perspective

Lori A. Panther, MD, MPH

Infectious Diseases specialist at Beth Israel Deaconess Medical Center and Assistant Professor of Medicine at Harvard Medical School



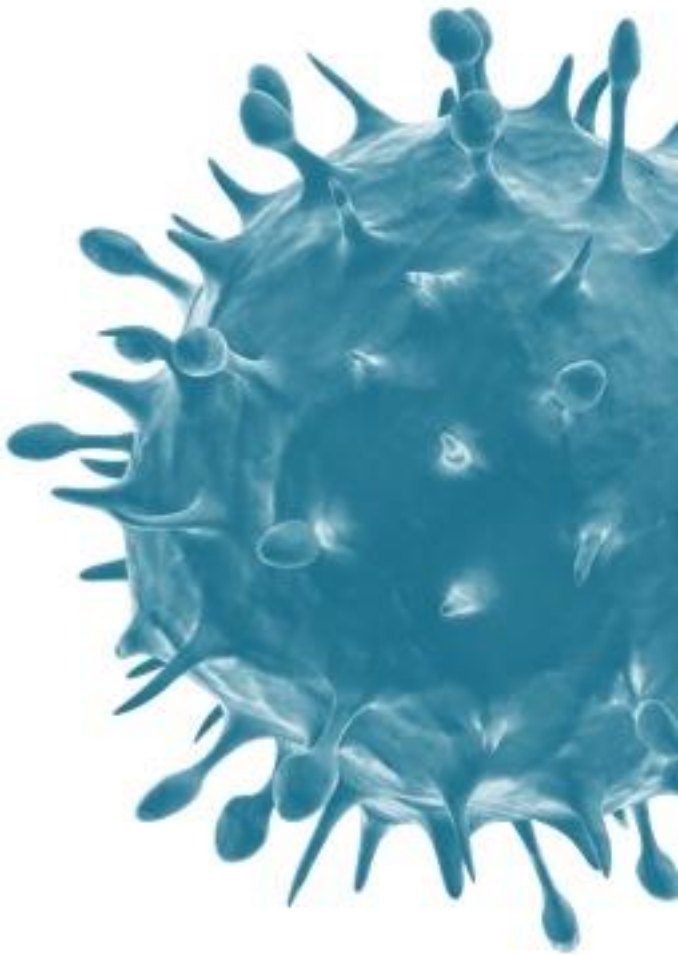
Potential H2 2017 Phase 3 Start for GEN-003 On Track

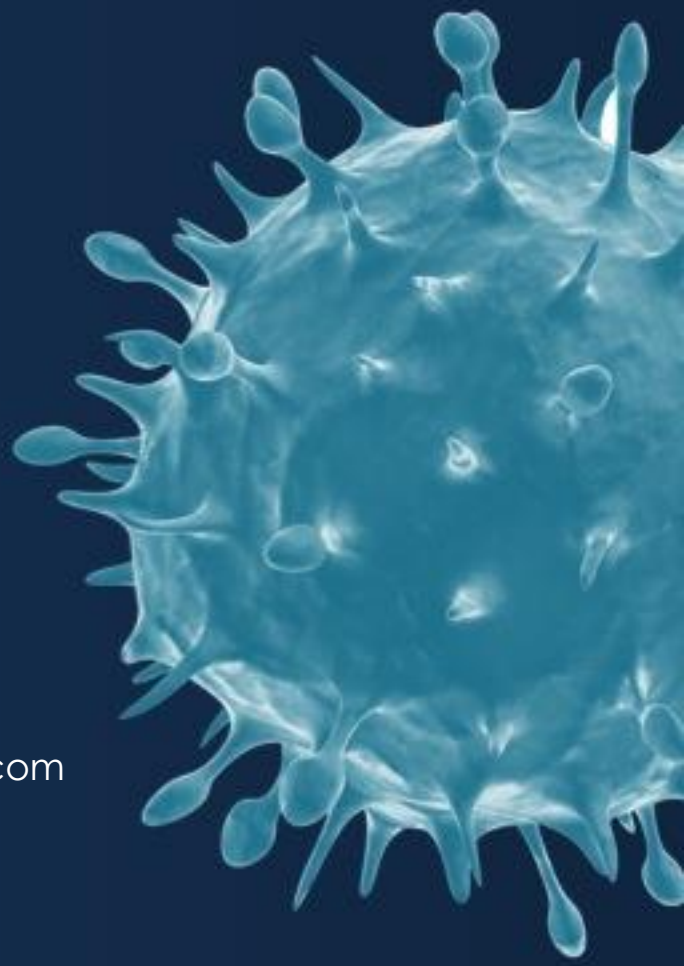


Conclusions

- Virologic efficacy profile of Phase 3-ready GEN-003 formulation confirmed for 60 / 50 µg dose ahead of Phase 3
- GEN-003 safety profile appears acceptable
- 60 / 50 µg dose selected for subsequent trials
  - Phase 2b antiviral combination study start expected in Q4
  - Potential Phase 3 start in second half of 2017 on track
- 6 month Phase 2b clinical efficacy data expected January 2017
  - In prior trial, virologic efficacy post dose 3 translated into significant and durable clinical efficacy, at 6 and 12 month time points

Questions & Answers





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