Developing Bacteriophage Therapies for Patients with Antibiotic-Resistant Infections

September 11, 2017

NYSE MKT: APHB
Safe Harbor Statement

This presentation contains “forward-looking” statements that involve risks, uncertainties and assumptions. If the risks or uncertainties materialize or the assumptions prove incorrect, our results may differ materially from those expressed or implied by such forward-looking statements. All statements other than statements of historical fact could be deemed forward-looking, including, but not limited to: the potential future of antibiotic resistance; the ability for bacteriophage therapies to disrupt and destroy biofilms and restore sensitivity to antibiotics; the planned development strategy, including the number of patients to be treated under expanded access guidelines in 2017 and 2018; using data from expanded access cases to demonstrate the clinical utility of phage therapy; using data from expanded access cases to select indications and define treatment regimens for further development in 2018; presenting data to regulatory agencies and define studies required for registration in mid-2018; the expected timing of additional clinical trials, including Phase II or registrational clinical trials; the drug product candidates to be supplied by AmpliPhi for clinical trials; bacteriophage technology being uniquely positioned to address the global threat of antibiotic resistance; the protection of intellectual property; the activities to be performed by specific parties in connection with clinical trials or expanded access cases; the potential use of bacteriophages to treat bacterial infections; research and development plans; the development of bacteriophage-based therapies; the ability to select combinations of phages to formulate product candidates; the ability to manufacture product candidates; the safety and efficacy of product candidates; potential and expected financing arrangements; collaborations with third parties and the potential markets for product candidates; potential market growth; the expectation that existing cash resources will be sufficient to fund operations through mid-2018; and any statements of assumptions underlying any of the items mentioned. These statements are based on estimates and information available to us at the time of this presentation and are not guarantees of future performance. Actual results could differ materially from our current expectations. You should not rely upon forward-looking statements as predictions of future events. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee that the future results, levels of activity, performance or events and circumstances reflected in the forward-looking statements will be achieved or occur. Moreover, we undertake no obligation to update publicly any forward-looking statements for any reason to conform these statements to actual results or to changes in our expectations except as required by law.

We refer you to the documents that we file from time to time with the Securities and Exchange Commission (the “SEC”), specifically our Annual Report on Form 10-K and our Quarterly Report on Form 10-Q file with the SEC. These documents, including the sections therein entitled “Risk Factors,” identify important factors that could cause the actual results to differ materially from those contained in forward-looking statements.
“The world is headed for a post-antibiotic era, in which common infections and minor injuries which have been treatable for decades can once again kill.”

Dr. Keiji Fukuda, WHO’s Assistant Director-General for Health Security, 2014
Antibiotics Are Losing the Bacterial Resistance Race

Source: CDC 2017
Resistant Bacterial Infections Responsible for Over 20,000 Deaths per Year in U.S. Alone

<table>
<thead>
<tr>
<th>Bacterial Infection</th>
<th>U.S. Incidence of Resistant Hospital Associated Infections</th>
<th>Annual Deaths Attributed to Resistant Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invasive methicillin-resistant <em>Staphylococcus aureus</em> (MRSA)</td>
<td>80,400</td>
<td>11,200</td>
</tr>
<tr>
<td>Drug-resistant <em>Streptococcus pneumoniae</em></td>
<td>1.2M</td>
<td>7,000</td>
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<tr>
<td>Vancomycin-resistant <em>Enterococci</em> (VRE)</td>
<td>20,000</td>
<td>1,300</td>
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<tr>
<td>Carbapenem-resistant <em>Enterobacteriaceae</em> (CRE)</td>
<td>9,000</td>
<td>600</td>
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<tr>
<td>MDR <em>Acinetobacter baumannii</em></td>
<td>7,300</td>
<td>500</td>
</tr>
<tr>
<td>MDR <em>Pseudomonas aeruginosa</em></td>
<td>6,700</td>
<td>440</td>
</tr>
</tbody>
</table>

>20,000

Source: CDC 2017
The Story of Mr. P
Critically Ill Patient Suffering from MDR *A. baumannii* Infection

- 68-year-old male suffering from MDR *Acinetobacter baumannii* abdominal infection
- Multiple courses of antibiotics over 4 months: vancomycin, meropenem, colistin, tigecycline, azithromycin, and rifampin
- Critically ill; in a coma for several weeks
- Multi-disciplinary team of UCSD, Texas A&M, SDSU, US Navy, and AmpliPhi developed personalized phage therapy
Phage therapy administered IP and IV, under FDA-allowed Emergency IND at UC San Diego

Patient emerged from coma 4 days after initial phage administration

*A. baumannii* infection was cleared and patient continues to be doing well

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There is urgent need for novel therapies to combat antimicrobial resistance

We are developing bacteriophage therapies for serious infections where antibiotics fail

• Kill bacteria by cell lysis – targeted approach with MoA different from antibiotics
• Disrupt and destroy biofilm
• Restore sensitivity to antibiotics

AB-SA01 in development for *Staphylococcus aureus* infections

• Completed two Phase 1 studies (intranasal and topical)
• Positive feedback from FDA in 1Q17
• First patient treated IV for life-threatening endocarditis infection in 3Q17

AB-PA01 in development for *Pseudomonas aeruginosa* infections

• Positive feedback from UK MHRA regarding planned Phase 1 in CF
• First patient treated IV and by inhalation for life-threatening lung infection in 2Q17

Strategy to demonstrate clinical evidence under Expanded Access by early 2018

• Treat at least 10 patients in 2017 and additional patients in 1H18: serious MDR infections
• Present data to FDA and define studies required for registration in mid-2018
• Initiate Phase 2/registrational studies of AB-SA01 and/or AB-PA01 potentially as early as 2H18
Bacteriophages as Targeted Antibacterials

- Naturally-occurring viruses
  - Infect and kill only bacteria
  - Target specific bacterial strains

- Phages are most abundant and diverse organisms on Earth
  - Humans co-exist with phages
  - Variety of phage types capable of infecting and killing most, if not all, strains of bacteria

- Discovered in 1915 and used broadly in U.S. and Europe to treat bacterial infections prior to development of antibiotics
  - Efficacy broadly, yet anecdotally, demonstrated
  - Early 20th century challenges: understanding MoA, characterization, potency, purification
How Phages Destroy Bacteria

A bacteriophage parachutes binds to receptor on bacterium

Phage uses its tail to poke into the bacterium and injects its genetic material

Bacteriophages take over bacterium’s metabolism

The bacterium is killed (lysed) as the phages burst out of it and further propagate
Bacteriophages as Targeted Antibacterials

Distinct and complementary mechanisms:

- Kill bacteria directly by cell lysis
- Disrupt and destroy biofilm
- Restore sensitivity to antibiotics
Bacteriophages Can Directly Kill Bacteria

*P. aeruginosa* Lung Infection Model

<table>
<thead>
<tr>
<th>Untreated</th>
<th>Ciprofloxacin (200 mg/kg SC)</th>
<th>Phage Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>6h</td>
<td><img src="untreated_6h.jpg" alt="Image" /></td>
<td><img src="ciprofloxacin_6h.jpg" alt="Image" /></td>
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<td>8h</td>
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<td><img src="ciprofloxacin_8h.jpg" alt="Image" /></td>
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<tr>
<td>24h</td>
<td><img src="untreated_24h.jpg" alt="Image" /></td>
<td><img src="ciprofloxacin_24h.jpg" alt="Image" /></td>
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</tbody>
</table>
Bacteriophages Can Destroy Biofilm
*S. aureus* Sheep Sinusitis Model

Drilling et al. 2014
Bacteriophage Therapy Can Restore Sensitivity to Antibiotics

- Phages can exert selection pressure on MDR bacteria to induce sensitivity to antibiotics
  - Bacteria have limited degrees of freedom to mutate around therapies

- Phage attack causes evolutionary trade-off in bacteria, restoring antibiotic sensitivity
  - Loss of resistance mechanisms
  - Loss of virulence factors

- Recent publications and clinical cases
Today’s Phage Therapy Enabled by Advances in Biotechnology

Enabling technologies

- Biologics manufacturing
- Purification (e.g., endotoxin removal)
- Sequencing
- Characterization

Advances in phage development

- Selecting and optimizing proprietary phage combinations
  - Maximize efficacy and host coverage
  - Minimize resistance
AmpliPhi’s Phage Library Targets Bacteria on WHO Priority Pathogens List

Priority Pathogens List published Feb. 25, 2017

Source: World Health Organization, 2017

Priority 1: CRITICAL

- **Acinetobacter baumannii**, carbapenem-resistant
- **Pseudomonas aeruginosa**, carbapenem-resistant
- **Enterbacteriaceae**, carbapenem-resistant, 3rd generation cephalosporin-resistant

Priority 2: HIGH

- **Enterococcus faecium**, vancomycin-resistant
- **Staphylococcus aureus**, methicillin-resistant, vancomycin intermediate and resistant
- **Helicobacter pylori**, clarithromycin-resistant
- **Campylobacter**, fluoroquinolone-resistant
- **Salmonella spp.**, fluoroquinolone-resistant
- **Neisseria gonorrhoeae**, 3rd generation cephalosporin-resistant, fluoroquinolone-resistant

Priority 3: MEDIUM

- **Streptococcus pneumoniae**, penicillin-non-susceptible
- **Haemophilus influenzae**, ampicillin-resistant
- **Shigella spp.**, fluoroquinolone-resistant
**AB-SA01 and AB-PA01 Overview**

**AB-SA01**
Covers 96% of 271 tested geographically and genetically diverse *S. aureus* strains, including MDR

**AB-PA01**
Covers 70-80% of 306 tested CF and non-CF *P. aeruginosa* strains, including MDR

*Broad host range, confirmed activity over time*
AB-SA01 and AB-PA01 are well-characterized products

- Fully sequenced genomes: lytic, non-transducing, no bacterial virulence or drug-resistance genes
- Broad host range, confirmed activity over time

cGMP manufacturing (AmpliPhi’s EU certified facility in Slovenia)

- Two-tiered banking system for manufacturing hosts and bacteriophages
- Phages produced by fermentation and purified by chromatography and filtration
- 1 mL vial liquid formulation
- Storage at +2-8°C
## Development Pipeline

<table>
<thead>
<tr>
<th>Program</th>
<th>Preclinical</th>
<th>Phase 1/Expanded Access</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
</table>
| **AB-SA01**  
(S. aureus)          | Intravenous: endocarditis,  
bacteremia, PJI          |                         |         |         |
|                        | Intranasal: CRS                 |                         |         |         |
|                        | Topical                          |                         |         |         |
| **AB-PA01**  
(P. aeruginosa)      | Intravenous: cUTI, cIAI, lung infections |                         |         |         |
|                        | Inhaled: lung infections, CF     |                         |         |         |
| **Other ESKAPE  
pathogens**          |                                  |                         |         |         |

- Positive feedback from MHRA Scientific Advice
- Positive feedback from FDA Type B meeting
FDA expressed support for phage therapy for patients with serious or life-threatening infections

“CBER acknowledged that phage therapy is an exciting approach to treatment of multidrug-resistant organisms and expressed a commitment to addressing the unique regulatory challenges that might arise during product development.”

Data from expanded-access cases could inform approval pathway

“CBER stated that the clinical safety and effectiveness data collected during development, including from emergency case studies, could inform future discussions for clinical development and ultimately, the regulatory pathway to approval.”

FDA is open for continued discussion
Bacteriophage Therapy: Scientific and Regulatory Issues
Center for Biologics Evaluation and Research (FDA)
and National Institute for Allergy and Infectious Diseases (NIH)
NIAID Conference Center
July 10-11, 2017

1:35-2:05 Getting from Lab Bench to Clinic: CMC and Practical Considerations for Phage Products
Susan Lehman, AmpliPhi Biosciences Corporation
Development Strategy: Leverage Expanded Access Clinical Data to Pave the Path to Approval

1. Focus on Expanded Access to demonstrate clinical utility of AB-SA01 and AB-PA01 by 1H18
   - Serious or life-threatening MDR infections (e.g., endocarditis, bacteremia, PJI, CF, cUTI)
   - Treat at least 10 patients in 2017 (eIND in U.S. or Special Access Scheme in Australia)
   - Treat additional patients in 1H18

2. Based on Expanded Access clinical and microbiological data, select indications and define treatment regimens for further development of AB-SA01 and AB-PA01

3. Present data to FDA and define studies required for registration in mid-2018

4. Initiate Phase 2/registrational studies of AB-SA01 and/or AB-PA01 potentially as early as 2H18
AB-PA01 Expanded Access Case: Patient with MDR *P. aeruginosa* Lung Infection at Major US Hospital

- Patient suffering from life-threatening MDR *P. aeruginosa* lung infection
- AB-PA01 administered under Emergency IND allowed by FDA
- Patient treated with multiple doses of AB-PA01 administered IV and by inhaler in 2Q17
- Treatment was well tolerated
- Data analysis is ongoing

First-in-human intravenous and inhaled administration of AB-PA01
AB-SA01 Expanded Access Case: Patient with *S. aureus* Endocarditis at Major Australian Hospital

- Patient suffering from life-threatening *S. aureus* infection of the heart (endocarditis)

- AB-SA01 administered under Special Access Scheme (SAS) of Australian Therapeutic Goods Administration (TGA)
  - SAS Category A – patient with a life-threatening condition

- Patient treated with AB-SA01 administered IV for 2 weeks in 3Q17

- Treatment was well tolerated

- Data analysis is ongoing

First-in-human intravenous administration of AB-SA01
Funding and Capitalization

• In May 2017, the Company completed an underwritten offering of common stock and warrants for $9.0M of net proceeds

• In September 2017, the Company received cash of $2.0M from the Australian Government as a tax rebate based on R&D activities in Australia

• The Company expects existing cash resources to be sufficient to fund operations through mid-2018

• 8.7M common shares outstanding and 17.8M fully diluted as of August 9, 2017*

• Publicly-traded NYSE American exchange – APHB

• Historically, partnerships have helped support development

*Share amounts outstanding include common stock only. Fully diluted includes outstanding warrants and stock options. Fully diluted amount does not include shares issuable under the 2016 Equity Incentive Plan or the ESPP Plan or the shares that are potentially issuable pursuant to the Common Stock Issuance Agreement. See the most recent Quarterly Report on Form 10-Q as filed with the SEC.
Upcoming Milestones

Demonstrate clinical utility of AB-SA01 and AB-PA01 under Expanded Access
  • Treat at least 10 patients with MDR infections in 2017
  • Treat additional patients in 1H18  \textit{Late 2017} \textit{1H 2018}

Select indications and define treatment regimens for further development of AB-SA01 and AB-PA01 \textit{1H 2018}

Present data to FDA and define studies required for registration \textit{Mid-2018}

Initiate Phase 2/registrational studies of AB-SA01 and/or AB-PA01 \textit{Potentially as early as 2H 2018}
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