Forward Looking Statements

This presentation contains forward-looking statements, including the timing of our drug development programs. Risks include delays in manufacturing created by third parties and the ability of clinical research organizations to recruit patients. Forward-looking statements also are prefaced by words such as "expect," "plan," "intend," "anticipate," and similar words. Forward-looking statements are based on our current expectations and assumptions regarding our business, the economy and other future conditions. Because forward-looking statements relate to the future, they are subject to inherent uncertainties, risks and changes in circumstances that are difficult to predict. Our actual results may differ materially from those contemplated by the forward-looking statements for a variety of reasons, including those contained in our Form 10-K, as amended, for the year ended December 31, 2015. We caution you, therefore, against relying on any of these forward-looking statements. They are neither statements of historical fact nor guarantees or assurances of future performance. We do not undertake any duty to update these forward-looking statements.
Company Highlights

*Clinical antiviral company with several compounds entering the clinic within 2 years*

3 Proprietary Technologies
- Protein Crystallography
- Antiviral nucleosides
- CRISPR/Cas9

Multiple Opportunities in Different Viral Diseases
- Influenza (PB-2 inhibitors, PB-1 Inhibitors, PA Inhibitors)
- Hepatitis C (non-nucleoside inhibitors-(NNI), nucleoside inhibitors, helicase inhibitors, NS5A inhibitors)
- Norovirus (nucleoside inhibitors, non-nucleoside inhibitors)
- Hepatitis B (CRISPR/Cas9)
- Human Papilloma Virus (CRISPR/Cas9)

Company Board and Leadership Have Proven Track Record
- Dr. Roger Kornberg and Dr. Ray Schinazi lead R&D team
Crystallography Technology Platform

Fragment hits

- Ability to **quickly grow** ultra-high resolution crystals
- **Rapid turnaround** of structural information through highly automated X-ray data processing and refinement
- Identifies **novel binding sites** – overlay structure of fragments bound to novel sites
- Provides 3D structure of inhibitor complexes at **near-atomic resolution** – provides immediate insight to guide structure-activity relationships (SAR)

Photo highlights fragments binding to novel binding sites
Cocrystal Drug Discovery Process

- Near atomic resolution, X-ray quality crystal production
- Drug pocket selection
- Hit-to-lead process
- Lead optimization

- Proprietary ARTIST fragment libraries
- 4-8 fragments/cocktail
- Soaked with protein crystals
- Cocrystals
  (protein crystals complexed with fragments)

Drug candidates
## Opportunities

*There exists significant unmet medical needs across a large variety of viral infections including...*

<table>
<thead>
<tr>
<th>Influenza A &amp; B</th>
<th>Hepatitis B &amp; C</th>
<th>Norovirus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal and pandemic</td>
<td>Leading causes of liver failure and liver cancer</td>
<td><strong>Chronic (potentially orphan indication)</strong></td>
</tr>
<tr>
<td>3 - 5 million infections/year</td>
<td>Chronic infections &gt;100 million HCV &gt;400 million HBV</td>
<td><strong>Acute gastroenteritis</strong></td>
</tr>
<tr>
<td>Estimated economic impact of seasonal flu in US: $50B to $150B</td>
<td>Opportunity for shorter duration in HCV and a cure in HBV</td>
<td>&gt;250 million acute cases/year</td>
</tr>
</tbody>
</table>
| Economic cost in the US alone is >$5 Billion | | }
# Company Pipeline

<table>
<thead>
<tr>
<th>Viral Disease</th>
<th>Lead Discovery</th>
<th>Lead Optimization</th>
<th>Preclinical</th>
<th>IND</th>
<th>Phase I/II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-31244 (NS5B-NNI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC-2069 (NS5A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nucleoside</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helicase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norovirus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B (CRISPR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HCV Program Highlights

- Phase 1 initiated in April, 2016 for highly potent, pan-genotypic NNI
- IND-enabling studies ongoing for potential best-in-class NS5A inhibitor
- Lead selection of nucleoside inhibitor candidate in 2016
- Potential first-ever helicase inhibitor candidates

Several value-inflection opportunities
HCV Market Dynamics

**Today and in the future**

- 10+ million potential patients across the US, Japan, and Western Europe (not including new or re-infected patients)*
- There are projected to be over 8 million untreated HCV infected people in 2020*
- Currently treating 400,000+ patients per year
  - it will take many years to test & treat potential HCV patients
- Many undiagnosed patients with HCV infections which will result in continued detection of new patients
- Pricing will be competitive, but the market will still be significant in the foreseeable future

* According to Bloomberg Intelligence (BI) projections, as of 2016
HCV Program Combinations

Multiple opportunities in developing combination ultra-short, all oral pan-genotypic cure (in-house or with partners)

De-risked near-term approach creating multiple “Shots on Goal”

- Pan-genotypic NS5B NNI
- Pan-genotypic NS5A Inhibitor
- Pan-genotypic NS5B Nuc
- Pan-genotypic Helicase Inhibitor

Multiple possibilities for combination drugs
CC-31244: Pan-genotypic NNI

• Highly potent NS5B polymerase inhibitor ($\text{EC}_{50} = 7 \text{ nM}$)
• Pan-genotypic activity (GT 1-6)
• Excellent activity against common drug resistant variants ($\text{IC}_{50}$ fold change < 5-fold)
• Once daily dosing
• Phase 1 initiated April, 2016
• Antiviral activity data in HCV subjects in 2H 2016
CC-31244: Pan-genotypic NNI

Binding to a highly-conserved drug binding site (NNI-4)

(A) HCV NS5B polymerase

(B) Highly conserved NNI-4 site among HCV genotypes
CC-2069: Pan-genotypic NS5A

- Novel, highly potent, pan-genotypic, NS5A inhibitor (GT1b EC$_{50}$ < 10 pM)
- Active against common drug resistant variants
- Favorable preclinical profile
- Once daily dosing
- IND-enabling studies in progress
HCV Nucleoside Program

*Search for next generation backbone for combination therapy*

- Company has evaluated a series of novel nucleoside pro-drug candidates over the past year
- Lead selection of best nucleoside inhibitor candidate and initiation of IND enabling studies in 2016
HCV Helicase Program

*Provides unique opportunities for drug combinations*

- Inhibits essential viral RNA unwinding process
- First-in-class pan-genotypic inhibitors (new mechanism of action)
- Highly conserved drug binding mode demonstrated in all genotype crystals developed (GT 1-6)
- Potentially an ideal combination candidate with HCV Nuc, NNI, NS5A, and/or protease inhibitors
Influenza Program

*Influenza leads: PB2, PB1 and PA Inhibitors*

- Focus on three different classes of influenza polymerase inhibitors: PB2 (cap-binding), PB1 (polymerase), and PA (endonuclease)

- Novel, potent structure-based influenza A PB2 inhibitors developed

- Currently developing pan-influenza (influenza A&B) inhibitors

Influenza polymerase complex

![Influenza polymerase complex](image)
Influenza Program

Leads bind to highly conserved binding pocket

Selected influenza A PB2 crystals

- H1N1 2009 Virginia
- H1N1 1918 Spanish
- H7N9 2013 Zhejiang
- H5N1 1996 Guangdong

Influenza PB2 inhibitor

- H1N1 2009
- H5N1 1996
- H7N9 2013
- H1N1 1918
Norovirus Program

*Unmet & underappreciated medical need*

- Prophylaxis
- Treatment
  - Acute (foodborne)
  - Chronic (Immunocompromised)
  - Chronic (transplant patients)

19-20 million illness each year (1 in 14 Americans become ill each year)
Norovirus Program

Broad spectrum Noro Polymerase Inhibitors

**Noro nucleosides**
- Active nucleoside candidates identified
- Animal model data supports activity in vivo
- Optimization of nucleoside leads in progress

**Noro NNI**
- Drugable pocket identified

- Human Noro
- Human Norwalk
- Murine Noro

- Human Norwalk
- Human Noro
- Murine Noro
Hepatitis B market

There is no approved cure at this time

• HBV is estimated to have 400M chronically infected globally - as many as 2M infected with chronic HBV in US alone.

• Current therapies are limited and need to be administered life-long.

• There is a significant need for a therapy that can cure for HBV patients.
CRISPR/Cas9 Technologies

- In-licensed from Duke University and Emory University for Hepatitis B and Human Papilloma Virus
- Technology allows for editing of viral DNA
- Potential cure for chronic HBV
- Next steps: optimization of small Type II Cas9 proteins to continue this work in a humanized mouse model using AAV-mediated transduction of Cas9 and two sgRNAs.
Transformational Year: 2016

- **HCV**
  - Initiated clinical trial for CC-31244 (NNI)
  - Antiviral activity data in HCV subjects for CC-31244 2H 2016
  - IND-enabling studies of CC-2069 (NS5A)
  - Select lead nucleoside inhibitor
  - Select lead helicase inhibitor

- **Influenza**
  - Select lead influenza A PB-2 inhibitor compound

- **Norovirus**
  - Ongoing nucleoside/NNI discovery efforts

- **HBV (CRISPR Cas 9)**
  - Initiate in vitro proof of concept and animal model studies of CRISPR Cas 9 for hepatitis B