Pioneering Development in the Gut Microbiome

(NASDAQ: RTTR)
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<table>
<thead>
<tr>
<th>Stock Information*</th>
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<tr>
<td>Exchange</td>
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<tr>
<td>Symbol</td>
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<tr>
<td>Recent Price</td>
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<tr>
<td>52 Week Range</td>
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<tr>
<td>Market Cap</td>
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<tr>
<td>Com. Shares Outstanding</td>
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<td>Avg. 50 Day Vol</td>
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*As of February 15, 2018
Ritter Pharmaceuticals Overview

Microbiome Therapeutics Improving Human Health

• Develop novel therapeutics that modulate the gut microbiome to help treat/prevent diseases of significant unmet need
  – Gastrointestinal, Metabolic, Liver Disease, and Immuno-oncology

• Lead product candidate, RP-G28, is positioned to be the first FDA-approved drug for lactose intolerance (LI)
  – Large commercial market with significant unmet need
  – RP-G28 Phase 3 launches with First Patient In first trial T-Q2 2018

• Strong intellectual property portfolio and NCE status

• World-renowned scientific advisors and strong executive leadership
Lactose Intolerance Market Summary

Significant Market Opportunity

Key Demographics¹

- **>1 billion** global lactose intolerant population
  - 65 million in Europe
  - 90 million in Japan

- **40 million** U.S. lactose intolerant population
  - 9 million are moderate/severe patients
  - U.S. prevalence rates:
    - 90% Asian descent
    - 85% African descent
    - 75% Hispanic descent

No prescription drug currently available for LI despite patient desire and need for a prescription treatment

Global Penetration Rates of Lactose Intolerance²

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Unsatisfactory Treatment Options

Significant $ Spend on OTC Products

OTC Product Sales

• **$2.45 billion** FY2015 annual sales in U.S. for OTC LI products

• **$400/person** annual spend on LI management options

Current Treatments Lack Solution

• **60%** of patients *continue* to *seek* a better *solution* - reinforces unsatisfactory treatment options:
  
  - Challenging to avoid all dairy and “hidden” lactose can cause unexpected symptoms
  
  - Lactase Supplements are unreliable and modestly effective

• **High importance** - Patients want to be able to consume a “normal diet” including dairy foods without worrying about symptoms

% of Patients Dissatisfied with Current Physician Recommended LI Management Options

- **Physicians**
- **Patient Satisfaction**

<table>
<thead>
<tr>
<th>Treatment Type</th>
<th>Physicians</th>
<th>Patient Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Avoidance</td>
<td>70%</td>
<td>54%</td>
</tr>
<tr>
<td>Lactase Supplements</td>
<td>65%</td>
<td>29%</td>
</tr>
<tr>
<td>Lactose/Dairy-Free Foods</td>
<td>66%</td>
<td>46%</td>
</tr>
</tbody>
</table>
Patients Seek Treatment
Symptoms Driving Strong Consumer Demand\textsuperscript{1,2}

Symptoms

• 82\% of lactose intolerance patients experience symptoms \textit{weekly} or \textit{more frequently}

• >50\% report their lactose intolerance \textit{moderately} or \textit{severely} impacts their daily activities

• Long-term health concerns (such as osteoporosis, hypertension)

LI Impacts Patient’s Daily Activity

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Doesn’t Impact</td>
<td>18%</td>
</tr>
<tr>
<td>Slightly Impacts</td>
<td>30%</td>
</tr>
<tr>
<td>Moderately Impacts</td>
<td>38%</td>
</tr>
<tr>
<td>Severely Impacts</td>
<td>15%</td>
</tr>
</tbody>
</table>

Treatment Demand

• 78\% of LI patients are interested in consuming dairy products without discomfort

• LI patients are \textit{VERY} likely to \textit{ASK} for and \textit{TAKE} an FDA-approved treatment

• >70\% of LI patients are “extremely interested” or “interested” in an FDA-approved treatment

Consumer Interest in FDA-Approved Drug to Treat Lactose Intolerance

<table>
<thead>
<tr>
<th>Interest Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Interested</td>
<td>38%</td>
</tr>
<tr>
<td>Interested</td>
<td>35%</td>
</tr>
<tr>
<td>Slightly Interested</td>
<td>18%</td>
</tr>
<tr>
<td>Not Interested</td>
<td>9%</td>
</tr>
</tbody>
</table>

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\textsuperscript{2}\textsuperscript{,} Engage Health Inc., "Market Potential for an Rx and Nutritional Supplement Product for Lactose Intolerance in the US." June, 2008.
Modulates the gut microbiome: Designed to stimulate growth of lactose-metabolizing colonic bacteria

Novel, non-digestible oligosaccharide
- Ultra high-purity
- Expected to be limited to the GI tract (study planned)

One-time, 30-day course of treatment
- Early results suggest 1 course of treatment may provide long-lasting, durable relief
- Patients likely can be safely re-treated (study planned)

Provided in single dose packets as a powder to be mixed with water

Target claim:
For the treatment of lactose intolerance
Lactose Intolerance:
- Inadequate lactase activity in small intestine results in undigested lactose
- LI symptoms from undigested lactose are the result of:
  - Bacteria in gut ferments lactose that produces: abdominal pain, flatulence, cramping
  - Osmotically active lactose causes water retention in the gut: bloating and diarrhea

RP-G28 Promotes Colonic Adaptation
- Preferentially stimulates growth of lactose-metabolizing bacteria in the GI tract
  - Lactose-metabolizing bacteria compensate for the lack of endogenous lactase activity
  - Decrease proportion of gas-producing bacteria
- Lactose is broken down, reducing gas production and water retention, thus reducing gastric symptoms
RP-G28 Development

- RP-G28 is one of the most advanced therapeutics in microbiome research & development
  - Phase 2a trial (n=62) demonstrated proof-of-concept and tolerability
  - Phase 2b/3 trial (n=377) demonstrated clinically meaningful benefits to patients, safety and tolerability
  - Completed End of Phase 2 Meeting with the FDA, entering Phase 3
Phase 2b/3: Clinical Trial Protocol Design

Largest double-blind, placebo-controlled LI study ever conducted

- Double-blind, placebo-controlled, dose ranging study, conducted at 15 U.S. clinical sites, n=377
- Inclusion/Exclusion
  - Minimum severity of LI assessed by blinded lactose challenge and lactase deficiency confirmed by standard hydrogen breath test
- Primary Endpoint
  - Employed a patient-reported outcomes tool validated by outcomes experts
  - Proportion of subjects who report a clinically meaningful reduction in lactose intolerance symptoms, comprised of a composite score of the most commonly reported GI symptoms (abdominal pain, cramping, bloating and gas)
  - Primary and secondary endpoints incorporate FDA's recommendations prior to un-blinding the data

**Screening Phase**

- Screening & Randomization
- Baseline Measurements

**Treatment Phase**

- No Dairy Consumption
  - Group A: RP-G28 Low Dose
  - Group B: RP-G28 High Dose
  - Group C: Placebo

**Post-Treatment Phase**

- Dairy Consumption
  - Post-Treatment Measurements
  - 30-Day Dairy Consumption
  - 30 Day's Post-Treatment Measurements

- 7 days ➔ 1-30 days ➔ 31 day ➔ 32-60 days ➔ 61 Day ➔
• **Significant reduction of lactose intolerance symptoms after a 30-day course of treatment**

• **Primary endpoint met statistical significance in efficacy subset analysis**
  
  – A statistically significant difference from placebo was reported with both doses: low dose: \( p=0.0434 \); high dose: \( p=0.0294 \)

• **14% difference between RP-G28 & placebo is comparable with recently FDA-approved GI drugs that averaged 11% change**

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1. Defined as patients reporting a \( \geq 4 \)-point change in LI Symptom Composite Score post-treatment (Day 31) compared to baseline or a zero LI Symptom Composite Score post-treatment.
2. Observed inconsistent data from one study center (\( n=72 \)) was excluded from analysis (Efficacy Subset, \( n=296 \))
3. Comparable endpoint delta analysis includes Amitiza, Entyvio, Viberzi, Linzess
Phase 2b/3: Summary Results*

Clinically Meaningful Benefits

- **40%** Report Meaningful Treatment Benefit (i.e.: Dramatically Reduced Symptoms of LI) Post-Treatment

- **83%** Report Adequate Relief

- **66%** Very or Extremely Satisfied

- **1.5 Cups/d** Milk Consumed by Patients 30-Days After Treatment

*Results includes Efficacy Subset population and does not include inconsistent data from one study center
1. Interim analysis of Phase 2b/3 Extension Study
Phase 2b/3: Individual LI Symptoms
Meaningful Clinical Response in LI Observed

• Treatment patients were more likely to report **complete elimination of each symptom and composite score** compared to the placebo group.

% Patients Reporting Complete Elimination Symptom

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Placebo</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Pain</td>
<td>22%</td>
<td>37%</td>
</tr>
<tr>
<td>Cramping</td>
<td>16%</td>
<td>35%</td>
</tr>
<tr>
<td>Bloating</td>
<td>16%</td>
<td>30%</td>
</tr>
<tr>
<td>Gas Movement</td>
<td>2%</td>
<td>16%</td>
</tr>
<tr>
<td>Symptom Composite</td>
<td>2%</td>
<td>13%</td>
</tr>
</tbody>
</table>

P-Value

1. Patients reporting a ≥4-point improvement from baseline or a score of zero post-treatment.
2. Efficacy Subset PP, observed inconsistent data from one study center was excluded from analysis.
Phase 2b/3: Global Patient Assessment Data

Positive Patient’s Perspective on Symptom Improvement

- All key global patient assessments: Consistently support statistically significant and clinically meaningful treatment benefits
  - No or mild symptoms over 7-days when dairy was introduced back into their diets
  - Very or extremely satisfied with RP-G28 preventing or treating their lactose intolerance symptoms
  - Adequate relief from lactose intolerance symptoms after treatment
  - Very much or much improvement 30-days after treatment

1. Efficacy Subset PP, observed inconsistent data from one study center was excluded from analysis.
Phase 3
Planned Clinical Trial Protocol Design

- Double-blind, placebo-controlled, multi-center trial
- Designed with input from an End of Phase 2 Meeting with the FDA
- Two confirmatory clinical trials (trial design similar to Phase 2b/3)
  - Well-defined patient population with improved screening criteria
  - Validated symptom assessment measures to capture appropriate clinical outcome endpoints
  - Longer study assessment period to allow for claims of durability of effect
- Primary endpoint: Comparing baseline composite symptom score to 30-days post-treatment and 7-days of dairy intake symptom score

**Screening Phase**
*No Dairy Restriction*
- 7-Day Real World Milk/Dairy Assessment
- Blinded Lactose Challenge/HBT

**Treatment Phase**
*No Dairy Consumption*
- 1:1 Randomization
  - Group A: RP-G28
  - Group B: Placebo

**Post-Treatment Phase**
*Dairy Consumption*
- Blinded Lactose Challenge
- 30-Day Real World Milk/Dairy Assessment
- Blinded Lactose Challenge

**Durability**
*Dairy Consumption*
- Lactose Challenges
- 7-Day Real World Assessments

-10 days → 1-30 days → 31 day → 32-60 days → 61 day ← 3 & 6 months →
Strong Intellectual Property

30 Issued Patents Worldwide

- Formulation: 11 issued patents - US, AU, DE, ES, FR, GB, IT & NL
- Methods of Use: 13 issued patents - US, AU, DE, ES, FR, GB, IT, NL & ZA
- NCE Market Exclusivity
  - From date of approval, 5 years in the United States and 10 years in Europe
- Additional Information
  - Most patents expiring in 2030, with a potential Patent Term Extension in the United States (and SPC in Europe)
  - 25 pending patent applications in the United States and other key international markets
  - Formulation options for follow-on/generic products may be limited, as approval for such a product is based on bioavailability, a bioavailability might be difficult to establish for a modified formulation

Formulation Patents: US9,579,340; US9,775,860; US9,808,481; US9,592,248; AU2017200343; DE602010036226.4; ES10746529; FR2400839; GB2400839; IT502016000104943; NL2400839
Method of Use Patents: US8,492,124; US9,370,532; US9,775,860; US8,486,668; US8,785,160; AU2017200343; DE602010036226.4; ES10746529; FR2400839; GB2400839; GB2480042; IT502016000104943; NL2400839; ZA2011/06066
Manufacturing Process Patents: US9,200,303; CH2462234; CN201080035013.2; JP6105680; KR10-1776164; DE60 2010 013 526.8; FR2462234; GB2462234; IE2462234; IT1395068; NL2462234
Thank You

Ritter Pharmaceuticals, Inc.

www.RitterPharma.com
# Leadership and Management

<table>
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<tr>
<th>Position</th>
<th>Experience</th>
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<tbody>
<tr>
<td>Ira E. Ritter</td>
<td>40+ years serving on Executive Boards; Rockwood, Oak Media, RG Publishing</td>
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<tr>
<td></td>
<td>• President and Chairman of Rockwood, produced over 200 private label HBA</td>
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<td></td>
<td>products for major national retailers including GNC and K-Mart</td>
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<tr>
<td>Michael D. Step</td>
<td>32+ years of experience in the pharmaceutical industry</td>
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<tr>
<td></td>
<td>• Recently, Sr. VP Corp. Development at Santarus (acquired by Salix in 2014);</td>
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<tr>
<td></td>
<td>formerly VP Corp. Development at Amylin Pharmaceuticals and positions at Dura</td>
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<tr>
<td></td>
<td>Pharmaceuticals, Hoffmann-La Roche &amp; Syntex Labs</td>
</tr>
<tr>
<td>Andrew J. Ritter</td>
<td>15+ years of research in gastrointestinal diseases</td>
</tr>
<tr>
<td></td>
<td>• Former President of Ritter Natural Sciences, developed and marketed digestive healthcare products. Wharton MBA</td>
</tr>
<tr>
<td>Jeffrey Benjamin</td>
<td>25+ years of financial accounting and finance experience</td>
</tr>
<tr>
<td></td>
<td>• Consulted or worked for a diverse group of public and private Companies.</td>
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<tr>
<td></td>
<td>Successfully completed IPO’s, negotiated and closed in excess of $1B in financing transactions.</td>
</tr>
<tr>
<td>Diane J. Plotkin, Ph.D.</td>
<td>25+ years of clinical discovery and global drug development experience</td>
</tr>
<tr>
<td></td>
<td>• Consulted or worked for both large-scale pharmaceutical companies and biotechnology companies. Former Sr. Director of Clinical Development Worldwide at ActivX Biosciences. Previously held positions at Merck Research Laboratories.</td>
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<tr>
<th>Board of Directors</th>
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<tbody>
<tr>
<td>Ira E. Ritter</td>
<td>Chairman</td>
</tr>
<tr>
<td>Matthew W. Foehr</td>
<td>President &amp; COO, Ligand Pharmaceuticals</td>
</tr>
<tr>
<td>Gerald T. Proehl</td>
<td>President &amp; CEO, Dermata Former President &amp; CEO, Santarus</td>
</tr>
<tr>
<td>William Merino, Ph.D.</td>
<td>Former Sr. VP Worldwide Regulatory Affairs at Warner Lambert Pharmaceuticals</td>
</tr>
<tr>
<td>Paul V. Maier</td>
<td>Former CFO, Sequenom, Inc.</td>
</tr>
<tr>
<td>Michael D. Step</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>Andrew J. Ritter</td>
<td>Co-founder and President</td>
</tr>
<tr>
<td>Noah J. Doyle</td>
<td>Managing Director, Javelin Ventures</td>
</tr>
</tbody>
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# Medical Advisory Board

<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Institution</th>
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<tbody>
<tr>
<td><strong>Dennis Savaiano, Ph.D.</strong></td>
<td>Chair; Professor of Foods &amp; Nutrition &amp; Associate Provost at Purdue University; Considered one of the foremost experts on lactose intolerance in the world</td>
</tr>
<tr>
<td><strong>William J. Sandborn, M.D.</strong></td>
<td>Chief, Division of Gastroenterology and Director at University of California San Diego Inflammatory Bowel Disease Center and Professor of Clinical Medicine</td>
</tr>
<tr>
<td><strong>William Chey, M.D.</strong></td>
<td>Nostrant Professor of Gastroenterology &amp; Nutrition Sciences, Director of the GI Physiology Laboratory, and Co-Director of the Michigan Bowel Control Program at Michigan Medicine</td>
</tr>
<tr>
<td><strong>W. Allan Walker, M.D.</strong></td>
<td>Director of the Division of Nutrition at Harvard Medical School</td>
</tr>
<tr>
<td><strong>Todd Klaenhammer, Ph.D.</strong></td>
<td>Director of the Southeast Dairy Foods Research Center &amp; Professor of Food Science, Microbiology &amp; Genetics at North Carolina State University; National Academy of Science Member</td>
</tr>
<tr>
<td><strong>Byron L. Cryer, M.D.</strong></td>
<td>Professor of Medicine in Digestive &amp; Liver Diseases and Associate Dean at the University of Texas Southwestern Medical Center at Dallas &amp; the North Texas VA Health Care System</td>
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