#### PROPRIETARY END-TO-END PLATFORM









1,000s Gene Candidates



Traits



10,000s Strains



100s Greenhouse Leads



Dozens Field Leads



Largest sequenced microbe collection 35,000+ Database tracks location, genome, sequence, bioassay and field results 100+ active lead strains and 3,000+ new insect control genes

#### Harnessing the Power of the Plant Microbiome

AgBiome turns discoveries made in the lab into products that help growers get more out of their crops. Through our proprietary Genesis™ discovery platform, we've managed to compile the world's largest, most diverse and fully sequenced collection of microbes. Through that screening process, we've identified multiple mode-of-action traits and highly effective biologicals that can be used to help solve some of agriculture's biggest problems.

With more than 35,000 fully sequenced microbes in our collection, we're well on our way to delivering on the AgBiome promise: Better microbes. Better crops. Better world.™



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# EFFECTIVE BIOLOGICALS AND TRAITS FROM THE AGRICULTURAL MICROBIONE

#### PROPRIETARY END-TO-END PLATFORM



Largest sequenced microbe collection 35,000+

Database tracks location, genome, sequence, bioassay and field results

100+ active lead strains and 3,000+ new insect control genes

#### OUR PROPRIETARY GENESIS™ DISCOVERY PLATFORM

Agbiome's proprietary gene and strain identification system has enabled discovery of the world's largest, most diverse, fully sequenced collection of microbes.

#### 2017 AGBIOME PRODUCT PIPELINES



#### WHO IS AGBIOME<sup>™</sup>?

AgBiome is a biotechnology company focused on the discovery of high-potential microbial genes, strains and proteins for development of new biologicals and traits for the crop protection market.



Effective Biologicals and Traits from the Plant Microbiome

December 6, 2016

### MOUNTING PRESSURES DRIVING NEED FOR INNOVATION



### AGBIOME



### Vision: Most Successful Ag Innovator

Best and most new products Happiest, most productive employees Highest financial returns

### TEAM

- Most important success
  factor
- Most experienced in the industry

1/3 of employees involved in discovery of a commercial product

### PRODUCTS

- Crop protection focus
- Biologicals
- Traits
- Multiple products
- 1<sup>st</sup> launch in Jan 2017

### STRUCTURE

- Expanding discovery engine
- Sustainable returns
- Deal flexibility
- Multiple value capture modes

### **AGBIOME TEAM**

**Adrienne Carrington Alex Schlesinger** Allie Briner Amber McGuire Amber Smith **Amy Shekita** Andrew Graham Billie Espejo **Brooke Bissinger** Chad Keyser **Christie Beasley Christy Wiggins** Chuck Pepe-Ranney **Courtney Austin Courtney Bogard** Dan Tomso Dave Ingham **Dylan Kraus** Elizabeth Claypoole Elka Armstrong Fric Ward **Esther Gachango** Hai Tran Jake Trimble James Henriksen James Sievert

Jenna Bryant Jessica Parks Jill Paulik John Clark John Rabby John Ryals Karen Juan Katie Tyson Kelly Craig Kelly Smith Kelly Williamson **Kira Roberts** Kirk Nelson Kyle Beerv Larry Daquioag Larry Nea Lee Simmons Liz Gaston Lynn Dickey Mark Roberts Marie Encarnacion Mary Kroner Mathias Twizeyimana Maureen Schirtzinger Mauricio J. Borgen Melissa Grav

Michele Doyle Mike Koziel **Murray Spruill** Natarajan Balachander Nick Duck Phil Hammer **Rebecca Thayer** Rebekah Kelly **Robin Dale** Roger Kemble **Ryan Gerber** Sandy Volrath Sarah Watson Scott Rabe Scott Uknes Shank Palekar Sinnikka Smith Srujana Koganti **Stacey Badders Steve Ronvak** Ted Piatt Tim Ave-Lallement **Tracy Raines** Vadim Beilinson Vinh Pham Wayne Merkelson



### **AGBIOME: to date**



DISCOVERY

High Potential Microbial Genes, Strains and Proteins Through Proprietary Biodiversity Screening Platform

### DEVELOPMENT

**Two Product Families** 



BIOLOGICALS Strains Used Directly as Products

TRAITS Genes Used in Crops VALUE CAPTURE

Multiple \$B Markets 10 Deals, 4 announced

INITIAL FOCUS ON CROP PROTECTION

- Diseases
- Pests
- Weeds

Rich Product Pipeline 10 PROGRAMS 1 IN COMMERCIAL LAUNCH Industry-changing investors \$52M RAISED FROM: ARCH, BILL & MELINDA GATES FOUNDATION, HARRIS & HARRIS, INNOTECH, MONSANTO, NOVOZYMES, POLARIS, PONTIFAX AGTECH, SYNGENTA & UTIMCO



### **MARKET FOCUS**

#### **INITIAL FOCUS: CROP PROTECTION**





# PROPRIETARY, END-TO-END PLATFORM

• GENESIS™: Gene and Strain Identification System



# **The Genesis**<sup>™</sup> **Product Discovery Process**



### The AgBiome Strain and Sample Collection



The largest collection of fully sequenced microbes

# **2017 AgBiome Product Pipelines**

PROJECT	BIOLOGICAL	TRAIT	PHASE 0	PHASE 1	PHASE 2	PHASE 3	PHASE 4	Launch
Howler™								
Foliar Disease (incl. ASR)								
Soilborne Disease Control								
Weevil/Coleopteran Control								
Soft Bodied Insect Control								
Nematode Control (RKN)								
Corn Rootworm Control								
Lepidopteran Control								
Sucking Pest Control								
Nematode Control (SCN)								

Phase 0 is discovery

Phase 1 is early research; could involve proof of concept in model plants

Phase 2 is proof of concept in target crop(s)

Phase 3 is event selection, early regulatory and early product development work

Phase 4 is regulatory, development and pre-marketing - first sales are next

# **AgBiome Strain Collection Composition**

#### Most Common Genera

Genus	Count
Bacillus	10705
Pseudomonas	2588
Arthrobacter	1061
Variovorax	780
Pantoea	566
Agrobacterium	522
Leclercia	472
Enterobacter	396
Burkholderia	322
Microbacterium	278
Acinetobacter	204
Paenibacillus	202
Curtobacterium	190
Rhizobium	170
Stenotrophomonas	165
Chromobacterium	162
Ralstonia	148
Lactococcus	141
Serratia	140
Flavobacterium	115



#### **Clustering Isolates**

- Circles indicate isolate genomes
- Groups with the same color are clustered together
- Distance within group is proportional with number of shared proteins



#### **Seeing True Diversity**

- AgBiome uses whole-genome comparisons to see real diversity.
- Fast new classification algorithms developed—reflect real functional diversity.
- Common measures of genome identity (e.g. 16s sequence) are insufficient to capture microbial variation.



# Gene Discovery – Insect and Nematode Control Genes





# **Discovery of Biologicals for Disease Control**

- High throughput screening
- Laboratory assays for multiple diseases
- Greenhouse testing of pipeline strains
- Field validation of new products

*Rhizoctonia* control, soybean seed treatment

Asian soybean rust control -foliar application

Targeted Screening of Microbes for Disease Control











#### Significantly more efficacious than current biologicals and comparable to chemical treatment



# Howler<sup>TM</sup> Active Ingredient Profile -

### Pseudomonas chlororaphis

- Wettable powder; inert co-formulants are EPA regarded safe (4A) and minimal risk (4B)
- >20 months (and counting) stability at RT, shows stability in high UV
- Compatible with synthetic chemical fungicides
- Multiple modes of action
- EPA registration for non-food and food use in early 2017
- OMRI listing for organic use
- Patents pending on strain, uses, combination products



Endophytic colonization of roots

#### AGBIOME

# Howler<sup>™</sup> – Tomato – Botrytis

- A Non-inoculated control
- B Inoculated control with disease
- C Serenade with disease
- D Howler<sup>™</sup> consistent control



### Howler<sup>™</sup> – Strawberry – Botrytis





Yellow circles = Howler 1x rate Blue circles = Non-inoculated



# Howler<sup>™</sup> - Asian Soybean Rust Trial in Argentina





FIG 1 - Diagrammatic scale of soybean (Glycow max) rast severity (percentage of diseased leaf area). Applied as foliar spray at R1 and R3



### Efficacy comparable to synthetic chemicals

Source: Godoy et al. (2005).



# Seed Treatment Trials 2016, Purdue U.

Rhizoctonia and Pythium



Soybean Rhizoctonia-Purdue ST 2016







Control

# **Advancing New Pipeline Strains**



AFS21021





AGBIOME

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# **AgBiome Innovation Strengths**

- In-depth knowledge of technology and industry proven track record of innovation
- Focus on disease and pest control
- A growing pipeline of products biologicals and traits
- Strategic partnerships with industry leaders to commercialize discoveries
- Fermentation and formulation expertise
- Building a strong IP portfolio and ownership of microbial strains



### **LEVERAGING STRATEGIC PARTNERSHIPS**



#### AGBIOME

### Harvesting the Plant Microbiome™



### Thank You!