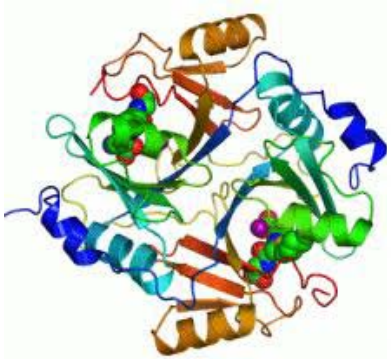
# Dyadic International

## *The Power of Proteins*



**January 2012**

# Safe Harbor Statement

Certain statements contained in this presentation are forward-looking statements. These forward-looking statements involve risks and uncertainties that could cause Dyadic's actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by such forward-looking statements. Except as required by law, Dyadic expressly disclaims any intent or obligation to update any forward-looking statements.

# Dyadic International

- A global biotechnology company
- Founded in 1979 by Mark Emalfarb
- Uses patented and proprietary technologies to discover, develop, manufacture and sell enzyme products and solutions
- Applications in bioenergy, biopharmaceutical and industrial enzyme markets
- Manufacturing enzymes since 1994
- Publicly traded since 2004 (DYAI)
- Headquartered in Jupiter, Florida, USA
- R&D arm located in the Netherlands

# What Are Enzymes?

- Enzymes are proteins found in all living things that cause chemical reactions to occur faster
- Enzymes are natural, safe and specific in targeting and accomplishing the acceleration of these reactions
- Enzymes are used in virtually all industries including in detergents, food processing, brewing, paper and biofuels
- For example, enzymes such as amylases and proteases are crucial in aiding human and animal digestion by breaking down starch and proteins

# Enzyme Productivity Goals

- **Development**
  - Developing and producing enzymes that perform a certain function
- **Quantity**
  - Developing and producing more enzymes at the same or lower cost in order to improve product margins
- **Efficiency**
  - Developing and producing enzymes that perform a certain function faster, better and less costly

# Investment Proposition

- Multiple applications for specialty enzymes in large diverse markets
- Dyadic has developed a robust mature patented platform technology that produces large quantities of enzymes and proteins for use in a variety of high value end products
- Capital-light royalty-driven model with low cash burn
- Demonstrated ability to create cost advantages for our customers and play a central role in the new “Sugar Economy”
- Proven, scalable, reproducible, large-scale production
  - Dyadic has used its technologies for itself and its partners to produce large volumes of low cost enzymes in the U.S., Canada, Poland, Spain and Mexico

# Ongoing Growing Value Creation

- Multiple paths to revenues, with diverse and differing timelines
- Revenue generation from integrated product sales, funded research & development, milestone payments, license fees and royalties
- Inked partnerships with world leaders in a wide range of markets we serve, providing risk diversification
  - Biofuels & Biochemicals
  - Animal Nutrition
  - Biopharmaceuticals
- Existing enzyme business with customers in 35 countries
- Seeking funded research in existing and new markets that is expected to lead to additional partnerships, licensees, etc.

# Topline Financial Performance

| | Fiscal Year 2010 | Nine Months Ended Sept. 30, 2010 | **Nine Months Ended Sept. 30, 2011** |
|---|---|---|---|
| **Product Revenue** | $7.4M | $5.5M | **$5.5M** |
| **R & D Revenue** | $1M | $618,000 | **$1.3M** |
| **Licensee Fee Revenue** | $37,000 | $32,000 | **$1M** |
| **Total Revenue** | **$8.4M** | $6.2M | **$7.9M** |

# Major Markets

## Biofuels

Develop and manufacture fuels and chemicals from agricultural feedstocks

Ethanol

Chemicals

## Biopharmaceuticals

Focus on developing and producing antibodies and other therapeutic proteins

Pharmaceutical Biotech

## Industrial Enzymes

Develop, manufacture and market enzymes and other biological products for a variety of industrial uses

Animal Feed

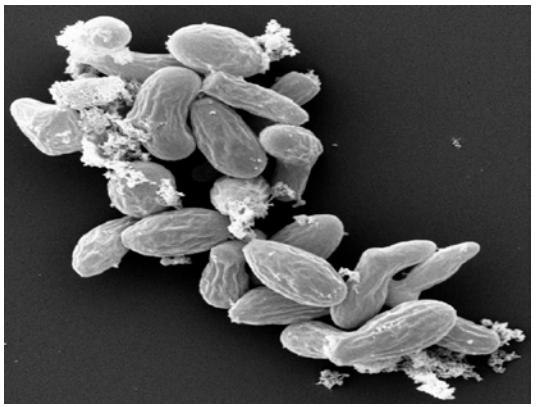
Pulp & Paper

Textiles

Food

# Dyadic's Patented C1 Technology

## A Proven Protein Production Platform



# What is C1?

- A robust versatile fungal expression system for gene discovery, expression and enzyme and protein production
- Based on a fungus called *Myceliopthora thermophila* isolated from alkaline soil in Eastern Russia
- Significant advantages over other microbial and cell culture-based systems
- Favorable fermentation characteristics
- High yields
- Programmable (annotated and sequenced genome)
- Commercially scalable to 150K liters
- Proven test results on wide range of feedstocks
- Performs well under broad pH and temperature conditions
- Lower costs
- Patent protected
- Broad platform capabilities validated through partnerships with key players

# Science Collaborations

The Scripps Research Institute

Scripps Florida™
The Scripps Research Institute

TNO

Ride the Wave of the Future with BTR!
BTR
Bio-Technical Resources

Moscow State University

NREL National Renewable Energy Laboratory
Innovation for Our Energy Future
U.S. Department of Energy

Wageningen Universiteit
Wageningen UR

SRNL Savannah River National Laboratory
We Put Science To Work
U.S. Department of Energy

Savannah River National Laboratory

Kluyver Centre
Kluyver Centre for Genomics of Industrial Fermentation

# Scripps Collaboration

- **One of the world's largest and most reputable biomedical research organizations**
  - Dr. Richard Lerner, President of Scripps and Chairman of Dyadic's Scientific Advisory Board
- **Sequenced and annotated C1 genome (2005-2008)**
- **Re-sequenced and re-annotated C1 genome (2009-2010)**
  - Expanding knowledge of C1 genetics
  - Provides information and knowledge to improve C1 Technology Platform – to do more for less at higher yields.
  - Provides new product candidates and enzyme catalysts to improve manufacturing processes
  - Enter new markets

SCRIPPS FLORIDA™
THE SCRIPPS RESEARCH INSTITUTE

# C1 Scientific Recognition


Cover Story
March 2007


Cover Story
June 2011


October 2011

See Dyadic scientific publications at http://www.dyadic.com/wt/dyad/patents

# Multiple C1 Opportunities

- Biofuels ($1.1 Trillion Market)
- Bio-based Chemicals ($150 Billion Market)
- Biopharmaceuticals ($115 Billion market)
- Industrial Enzymes  ($7 Billion Market)

# The New Sugar Economy

# Creating Sugars with Enzymes

- 1st generation ethanol is derived from food sources such as corn
- 2nd generation ethanol is derived from non-food plant materials (biomass) such as corn stover, switchgrass wheat straw and sugar cane bagasse which consist of lignocellulose, a structural material comprised of cellulose, hemicellulose and lignin
- This biomass can be degraded into sugars using cellulase, xylanase and hemicellulase enzymes
- These sugars are then fermented to create biofuels such as ethanol and biochemicals such as butanol
- Energy independence depends on producing the greatest amount of sugars at the lowest cost!!

# Using C1 to Create *Green Sugars*™






**Applying Dyadic's C1 technology to enable the production of abundant low-cost sugars from non-food biomass for use in manufacturing biofuels and biochemicals**

**Biomass + Enzymes = Sugars** → **-Biofuels**
**-Biochemicals**
**-Specialty Products**

# Producing Fuels / Chemicals from Low-Cost Non-Food Biomass

EXAMPLES OF LARGE POTENTIAL MARKETS

| Biomass | Sugars | End Markets |
|---|---|---|

$150B

Ethanol

$6B

Detergent Alcohol

$800B

Diesel Fuel

* Source: Codexis, December 2011

# I. Biofuels Market

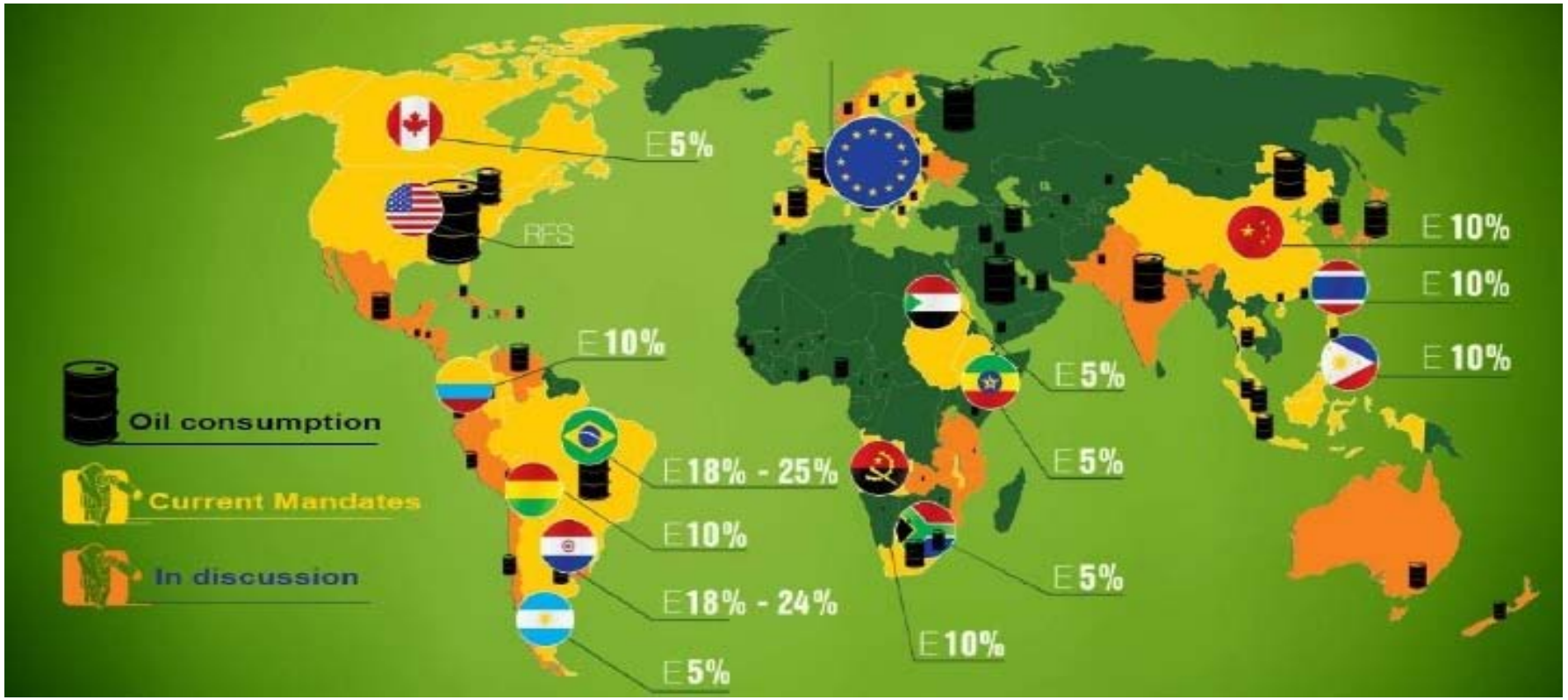
**Biofuels**

Develop and manufacture fuels and chemicals from agricultural feedstocks

Ethanol

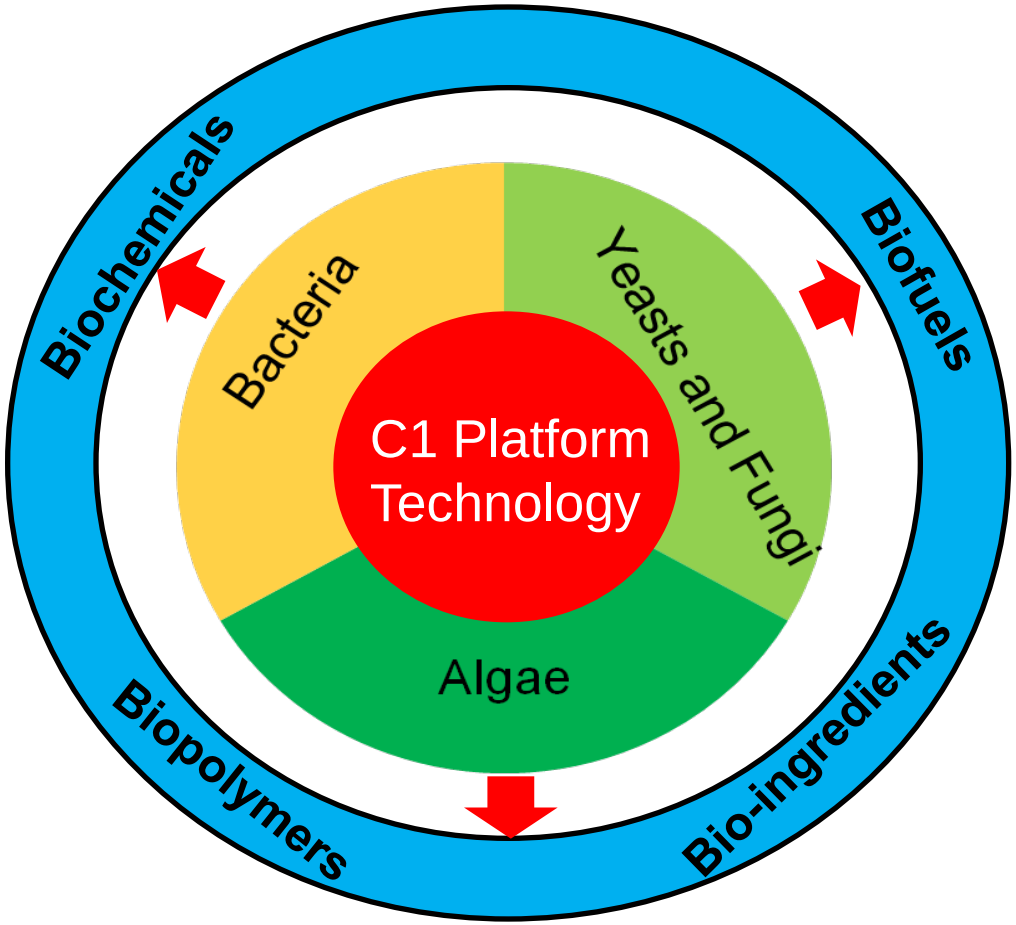
Chemicals

# Global Efforts to Meet the Rising Demand for Fuel




*Source: UNICA, The Rise of Ethanol Imports: Trends in Brazil's Ethanol Market, Sept 2011*

# C1's High Compatibility with Bio-based Processes



# Dyadic's Biofuels Licensees

CODEXIS®

raízen

Shell

cosan

- Partnered with Royal Dutch Shell, Cosan and Raizen
- Non-exclusive license agreement
- Covers use of C1 expression system for large-scale production of enzymes in biofuels, chemical and pharmaceutical intermediate production

| | | | | |
|---|---|---|---|---|
| CODEXYME™ CELLULASE | ✓20,000L scale-up in Mexico City<br>✓150,000L scale up with Iogen Energy in Canada<br>✓Launch of CodeXyme™ Cellulase | • 10 MT bagasse pilot with Chemtex<br>• Extension of Shell research agreement<br>• Commercial Samples to Chemical Industry | • Established CMO supply chain<br>• First commercial production<br>• Customer and partner agreements | • Commercial production<br>• Customer and partner agreements |

# Dyadic's Biofuels Licensees

ABENGOA

- One of the largest ethanol producers in the world
- R&D program led to non-exclusive license agreement
- Covers use of C1 expression system for large-scale production of enzymes for use in manufacturing of biofuels, power and chemicals
- Currently focused on enzymes for lignocellulosic bioethanol production
- Biomass Pilot Plant (US) in 2007 - 0.02 Mgal/yr capacity
  - Objective: competitive process with grain ethanol culture-based systems
- Biomass Demonstration Plant (Spain) in 2008 – 1.3 Mgal/yr capacity
  - Objective: demonstrate commercial-scale process systems
- Commercial Plant (US) in 2013
  - Objective: production at a cost line competitive

# Licensing Model vs. Commercial Enzyme Sale Model

- Proprietary Ownership
- Customized C1 Fungal Strains
  - Feedstock
  - Pre-treatment
  - Fermentation agents and process
  - Broad operating conditions (pH and temperature)
  - *Trichoderma*-based enzymes subject to patent/legal conflict
- Elimination of commercial enzyme production and transportation costs

# Dyadic's International Initiative

## The Abraham Group LLC

- Influential consulting firm led by former U.S. Secretary of Energy, Spencer Abraham
- Secretary Abraham also serves as non-executive Chairman of AREVA, Inc. and as a member of the Board of Directors of Occidental Petroleum
- Pursuing a global strategy to communicate advantages of Dyadic's C1 platform technology and its R&D capabilities to major international energy groups committed to cellulosic ethanol and other forms of sustainable energy

THE ABRAHAM GROUP LLC

# Global Outreach

# II. Industrial Enzymes Market



**Enzymes**

Develop, manufacture and market enzymes and other biological products for a variety of industrial uses


Animal Feed


Pulp & Paper


Food


Textiles

# Global Enzyme Market

- **Worldwide enzyme demand to reach $7.0 billion in 2013**
  - Cellulase enzyme demand alone is estimated to reach $10 billion by 2020
- **Fastest growing segments of the enzyme industry are animal feed and ethanol production**
- **Global leaders are Novozymes; Genencor (DuPont) and DSM**
  - Dyadic is a leading company focused on plant cell wall degrading enzymes
- **Limited number of commercially viable fungal expression systems**
- **Off-the-shelf solutions do not always satisfy complex challenges requiring a customized approach**

# Dyadic's Industrial Enzymes

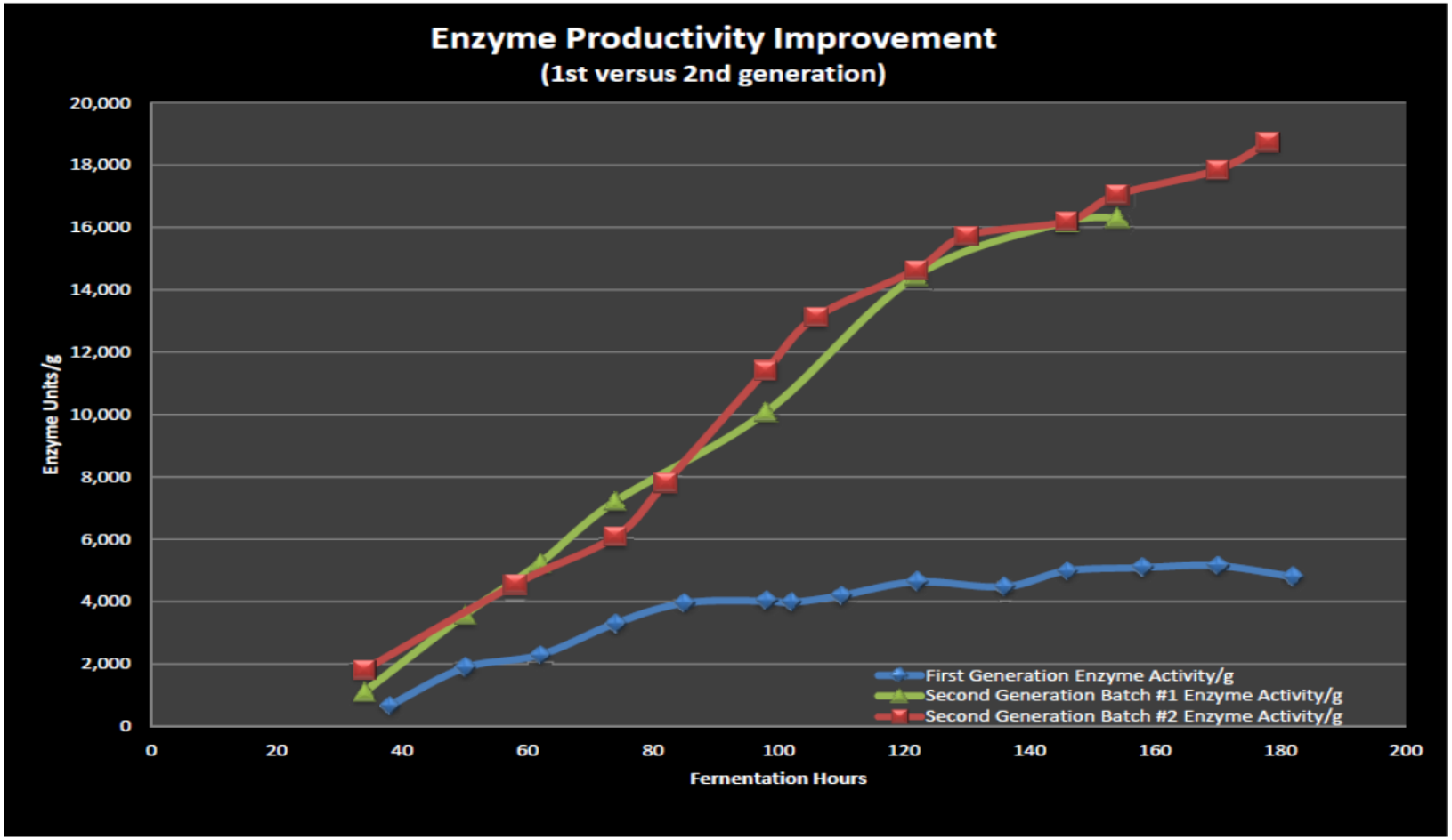
- A growing source of profitable revenue
- Provides further credibility to our research and licensing activities
- Over 20 product offerings including xylanases, cellulases, beta-glucanases and proteases
- Major applications include: animal feed, textiles, brewing and pulp & paper
- Enzyme revenue:

| | FY 2010 | Nine Months Ended 9-30-11 |
|---|---|---|
| | $7.4M | $5.5M |

- Markets support 35% - 40% gross margins

# Using C1 for Rapid Yield Gains

## Strong outlook for significant enzyme cost reductions



# Animal Feed Applications

- The animal feed market represents growing significance to all revenue-generating segments of Dyadic's business
- The animal feed enzyme market is approximately $600M and one of the fastest growing segments of the enzyme industry
- In June 2011, Dyadic entered into a long-term agreement with one of the top companies in the animal feed enzyme market and received a $1M access fee
- Goal is to express greater quantities of enzymes from selected genes in order to reduce costs and improve margins  while targeting better performing enzymes
- Dyadic will receive research funding, milestones and future royalties on net sales of C1-derived enzyme products by this partner

# III. Biopharmaceuticals Market

**Biopharmaceuticals**

Focus on developing and producing antibodies and other therapeutic proteins

Pharmaceuticals

Biotech

# Global Biopharma Market

- Global biopharmaceutical market expected to reach $182 billion by 2015
- Worldwide market for therapeutic antibodies is approximately $26 billion
- Limited number of commercially viable expression systems for producing drugs (e.g., CHO, Pichia) which all have severe limitations
- Many genes cannot be adequately produced using these systems
- Great interest in alternate production systems
- Use of C1 to produce proteins offers the potential to dramatically decrease the time and costs of producing pharmaceutical products

# Dyadic's Biopharma Partners

sanofi pasteur

- Currently conducting funded research at Dyadic Netherlands using C1 to develop certain vaccines
- First major partner for biopharmaceutical applications

EnGen

A company utilizing its game-changing manufacturing system to generate proprietary biologics and vaccines

- Business development partner and prospective master licensee of C1 for biopharmaceutical applications
- Seeking funding from additional partners

# Strong Intellectual Property

- **10 issued U.S. patents**
  - Broad claims blocking use of C1
- **10 pending U.S. patent applications**
- **74 issued foreign patents**
- **23 pending foreign applications**


The United States Of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extensions.

Director of the United States Patent and Trademark Office

# U.S. Management Team

| Name | Title | Experience |
|---|---|---|
| **Mark A. Emalfarb** | President and CEO<br>Chairman of the Board<br>Founder | Dyadic International, Inc. |
| **Adam J. Morgan, Esq.** | VP General Counsel<br>& Bus. Dev. / Secretary | Advance Publishers L.C.<br>Rexall Sundown, Inc. |
| **Michael J. Faby, CPA** | VP Finance | Perry Slingsby<br>PricewaterhouseCoopers |
| **Richard H. Jundzil** | VP Operations | Genzyme Corporation |
| **Thomas M. O'Shaughnessy** | VP Sales & Marketing | Hexion Specialty Chemicals<br>Occidental Chemical/GE |

# Summary—Key Points

- Large diverse markets with critical needs to improve productivity and efficiency
- C1 is a robust mature technology that can address these needs
- Continued validation from successful collaborations with global leaders in bioenergy, biopharma and animal feed
- Low expenditure licensing model designed to build the bridge toward long-term royalty streams from different industries
- Increased political awareness and government incentives to develop alternative sources of energy

# Thank You