Transforming the Next Generation of Biochemical Production
$1.6bn market projected to grow at 20% pa to 2025
Executive Team

Gerard Brandon, **cellulac Chief Executive Officer (2012- Present)**

- 1996 - 2008 CEO and Founder of Alltracel Pharmaceuticals PLC
  - Sold to HemCon Medical Technologies Inc in 2008
  - Developed and commercialised proprietary, FDA approved refined Cellulose
- Senior executive roles in Farmabrand Private Equity and Epixio Limited
- Fellow of the Ryan Academy of Entrepreneurs (Dublin)

Camillus Glover, **cellulac Chief Financial Officer (2012- Present)**

- 2003 - 2008 Commercial Director & COO of Alltracel Pharmaceuticals PLC
- 2009 - 2012 VP of Global Business Development for HemCon Medical Technologies
- Senior executive roles at Greenore Shipping Chartering Agency, Irish Shipping & Transport Ltd, Anord Electrical Controls, SSP Ireland Ltd & Bewley Group
- Member of the Institute of Chartered Accountants, Ireland

Patrick Walsh PhD. B.Sc. MBA, **cellulac founder and Chief Scientific Officer (2009-Present)**

- 2007 - present - Irish member of the International Energy Agency Taskforce on Biorefineries
- 2005 - Director of the BioSpark Project, the first multiple energy carrier and co-product Biorefinery in Ireland
- 2004 - Supply chain analysis and optimal design for Ireland’s first steam explosion fractionation Biorefinery
- 2002 - Founding Director of Biorefinery Ireland Ltd. Science Partner for FP5 EU project on Green Biorefineries
- 2002 - 2012 - Research & tertiary level lecturing at the GMIT & NUI, Galway
- 1980 - 2002 - Lead researcher in US Forest Service and UK Forestry Commission
- Member of the Board of Directors of the Technical Centre for Biorefining and Bioenergy
- Honorary Research Fellow at several Universities.
## PolyLactic Acid end uses

<table>
<thead>
<tr>
<th>Rigids</th>
<th>Food serviceware</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Images of rigid products" /></td>
<td><img src="image2.png" alt="Images of food serviceware" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nonwovens / fibres</th>
<th>Durables</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Image of nonwovens/fibres" /></td>
<td><img src="image4.png" alt="Image of durables" /></td>
</tr>
</tbody>
</table>
Introduction

- **cellulac** to produce high growth bio-chemicals using 2nd generation feed stocks
  - Lactic Acid, PolyLactic Acid, Ethyl Lactate & Sodium Lactate
  - US$ 1.6bn market; projected to grow at 20% pa to 2025

- Using innovative, patented production process

- Flexible supply chain from low cost agricultural and dairy by-products

- Capex light: To retrofit existing fermentation facilities
  - 100,000 MT pa production facility (ex brewery) in Ireland on highly preferential terms
  - Commission 20,000 MT pa by mid-2014

- Production cost 40% below existing biochemical producers

- Management team with extensive industry experience and commercial expertise
cellulac Overview

- September 2009 cellulac (Ireland) founded by Patrick Walsh (CSO)
- June 2012, Gerry Brandon and Camillus Glover join as CEO & CFO
- July 2013, acquired Pursuit Marine Drive Limited
  - SoniqueFlo
- November 2013, awarded an EU grant of €2.4 million
- November 2013, entered into an agreement to acquire Baywave Limited
  - Baywave agreement to lease, with option to buy, GNB facility
  - Formerly the 2nd largest brewery in Ireland
  - Retrofit to complete 2nd quarter 2014 for commissioning of 20,000 MT pa
  - 100,000 MT pa biochemical production eventual capacity commencing 2016
Our Plan

- Produce high quality, high margin Biochemicals for established markets
- Using second generation agricultural and dairy by products
- Optically pure Lactic Acid, Ethyl Lactate, PolyLactic Acid and Sodium Lactate
  - Food, pharma, biomedical, electronics and industrial solvent markets
- 20,000 tonnes of Ethyl Lactate pa by 2015
- Able to produce at 40% below existing production costs
- Use well defined existing distribution channel partners
- Revenues from own production, licence and joint venture opportunities
Flexibility of Second Generation Feedstocks

Wheat and Barley Straw
- Strong contractor distribution to brewing industry in place

Lactose Whey
- Large Dairy Industry producers
- Volume to double from 2015-2020 after EU milk quotas lifted

Spent Brewers Grains (Ethanol DDGS)
- Multiple Irish beer production and whiskey brewers

Lactic Acid
PolyLactic Acid
Ethyl Lactate
Sodium Lactate
## Core Markets

<table>
<thead>
<tr>
<th>Product</th>
<th>Category</th>
<th>Current volume (tonnes pa)</th>
<th>Approximate price (per tonne)</th>
<th>Segment value at median price</th>
<th>Projected growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactic Acid</td>
<td>Speciality chemical or ingredient in food and solvents</td>
<td>320,000</td>
<td>$1,300 - $2,300</td>
<td>$576m</td>
<td>20% pa until 2016</td>
</tr>
<tr>
<td>Speciality chemical or ingredient in bioplastics production</td>
<td>180,000</td>
<td>$1,300 - $5,000</td>
<td>$567m</td>
<td>28% pa until 2025</td>
<td></td>
</tr>
<tr>
<td>PolyLactic Acid</td>
<td>Substitute for fossil based polymers</td>
<td>100,000</td>
<td>$2,300 - $6,000</td>
<td>$415m</td>
<td>28% pa until 2025</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td><strong>600,000</strong></td>
<td><strong>$1,558m</strong></td>
<td><strong>24% pa until 2016</strong></td>
<td></td>
</tr>
<tr>
<td>Ethyl Lactate</td>
<td>Speciality chemical or material for high end electronics</td>
<td>10,000</td>
<td>$5,000</td>
<td>$50m</td>
<td>20% pa until 2025</td>
</tr>
<tr>
<td>Material for other electronic units, semi conductors and water based coatings</td>
<td>60,000</td>
<td>$3,000</td>
<td>$180m</td>
<td>18% pa until 2025</td>
<td></td>
</tr>
<tr>
<td>General purpose ingredient for cleaners and detergents</td>
<td>550,000</td>
<td>$2,000</td>
<td>$1,100m</td>
<td>18% pa until 2025</td>
<td></td>
</tr>
<tr>
<td>Sodium Lactate</td>
<td>Food, shampoo and soap ingredient</td>
<td>3,000,000</td>
<td>$1,000 - $2,000</td>
<td>$3,000m</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>4,220,000</strong></td>
<td><strong>$5,888m</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**cellulac process**

- Multiple second generation raw materials
- Innovative deployments of patented **SoniqueFlo**
- Proprietary enzymes
- Non-GMO bacteria
- No contaminated gypsum land fill waste product
- Up to 67% saving in energy costs results in 40% saving in cost of producing biochemicals such as Lactic Acid and PolyLactic Acid
Red = Velocities greater than Mach 2
Acquired from Pursuit Dynamics in July 2013

Developed by Dr Marcus Fenton, cellulac Chief Engineer

**SoniqueFlo** both in upstream and downstream contributes significant energy savings

Hydro Dynamic Cavitation at 1000 meters ps
- 50-300 MT per hour process capacity in a single unit

Drives 40% saving in production costs

Protected by strong family of patents

Group owns 7 units, 4 leased to US Ethanol producers
4 Layers of Protection

Application Process Patents

Device Patents

Sonochemistry Patents

Bacteria Culture Patents

How to use SoniqueFlo for specific applications

Design of mechanism and geometries of SoniqueFlo

Application of SoniqueFlo cavitation effect in biochemical processes

Enzyme, Bacteria, Institutional Know-How
Intellectual Property

- 23 families of patents and applications
  - 21 – **SoniqueFlo**
    - Hydrodynamic cavitation
    - 2 – Lactic Acid bacteria
- 85 granted or approved for grant patents
- 17 proprietary enzyme cell systems
- 52 pending or provisional patents
- Complemented by proprietary know how
- **cellulac** and **SoniqueFlo** are trademarks
First *cellulac* Biochemical Facility

- November 2013, agreement to acquire Baywave Limited
- Ownership of Baywave entitles *cellulac* to
  - Rent the Great Northern Brewery facility for 5 years, with;
  - Right to buy after 5 years to include rent paid

- Facility comprises 8 acres of the former Great Northern Brewery site
  - All equipment installed thereon
  - Until September 2013, was Ireland’s 2\(^{nd}\) largest brewery
  - In 2009 substantially renovated at an upgrade cost of €5.4m
10 x 400m³ Fermentation Tanks
26 x 200m³ Cold Storage Tanks
First **cellulac** Biochemical Facility

➢ Retrofitting of **cellulac** biochemical facility in 2 stages
   ➢ 1ˢᵗ phase: to produce 20,000 MT pa of Ethyl Lactate commencing June 2014
   ➢ 2ⁿᵈ phase to produce 100,000 MT pa of biochemicals to commence in 2016

➢ Comparative 2013 greenfield biochemical production site construction:
   ➢ Thyssenkrupp, 1,000 MT pa lactic acid facility in Germany cost €20m
   ➢ Ineos Inc., 24,000 MT pa 2ⁿᵈ generation biomass to bioethanol cost $130m (€100m)
Grants Awarded to **cellulac**

<table>
<thead>
<tr>
<th>Provider</th>
<th>Date</th>
<th>Amount</th>
<th>Amount still available for drawdown</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU Grant agreement</td>
<td>November 2013</td>
<td>€2.4m</td>
<td>€2.2m</td>
<td>To support the <strong>cellulac</strong> Group’s costs and expenditure in commercialising its technology platform for conversion of lignocellulosic materials to bio-chemicals</td>
</tr>
<tr>
<td>SPLASH Consortium Agreement</td>
<td>August 2012</td>
<td>€808,000</td>
<td>€416,000</td>
<td>To support the use of hydrodynamic cavitation on the creation or breaking of polymer chains</td>
</tr>
<tr>
<td>FUEL4ME Grant Agreement</td>
<td>December 2012</td>
<td>€317,470</td>
<td>€163,000</td>
<td>To support hydrodynamic cavitation to transform algae oils and fatty acids to biofuels</td>
</tr>
<tr>
<td>Austrian Government Development Grant</td>
<td>July 2013</td>
<td>€44,000</td>
<td>€44,000</td>
<td>To support the production of Ethyl Lactate as a derivative of Lactic Acid produced by the Group</td>
</tr>
<tr>
<td>Irish Development Grant</td>
<td>July 2012</td>
<td>€198,000</td>
<td>€22,000</td>
<td>To support testing of <strong>cellulac</strong> Group’s pre-treatment methods</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>€3.77m</td>
<td>€2.84m</td>
<td></td>
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</table>
View beneath 10 x 400m$^3$ Fermentation Tanks
Conclusion

- US$1.6bn market expected to grow at 20% pa to 2025
- Transformational next generation biochemical end-to-end solution
- Production cost differential 40% below existing biochemical producers
- Multiple high value & high growth products accessed via proprietary platform
  - Lactic Acid, PolyLactic Acid, Ethyl Lactate, Sodium Lactate
- Flexible supply chain from low cost agricultural and dairy by-products
- Capex-light retrofit existing fermentation facilities or biofuel plants on highly preferential terms
- Management team with extensive industry experience and commercial expertise
- Opportunity for significant value growth in next generation biochemicals
40% cheaper to Produce D(\text{-}) Lactic Acid Than any current producer