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Bone Biologics is redefining bone regeneration with Nell-1, a growth factor that has demonstrated to effectively increase the quantity and quality of bone across small and large animal models.
Healthcare Trends

With an aging population, musculoskeletal diseases are becoming a greater burden as the cost of treating long-term pain and disability increases.

People are seeking a more active lifestyle, therefore “Quality of Life” is becoming more important.

Bone regeneration is a significant medical challenge impacting millions of people globally.

The orthobiologics industry with its technology advancements will benefit patients and health systems through better outcomes, reduced surgical time, faster healing, and reduced costs.
Bone Biologics Attractiveness

Opportunity
- 3 billion global market opportunity in spine fusion
- Additional indications in trauma and osteoporosis

Technology
- Strong technology discovered at UCLA
- Proprietary product platform with strong IP

Pre-clinical Data
- Pre-clinical studies have shown increases in fusion and quantity of bone

Business
- A lean, virtual business model with leading strategic partners, vendors, and contractors

Regulatory Path
- A device/drug combo product
- Following medical device PMA tract to FDA approval
Bone Biologic’s Solution To Unmet Need

A major challenge in orthopedic surgery is effective bone regeneration

Challenges w/ rhBMPs

- Rapid bone growth (egg shelling)
- Cysts & less dense bone formation
- Not target-specific – will grow where bone is not present
- Swelling and intense inflammatory response in off label use

Proposed Nell-1 Solution

- Rapid / healthy bone growth
- Forms bone in target specific fashion without inducing inflammation and poor bone formation
- Does not initiate bone formation in muscle
- Can stimulate induced BMSCs to form bone in a rodent muscle pouch
- Exhibits specificity that BMPs lack

Source: The Spine Journal, JAMA
## Nell-1 Product Pipeline

<table>
<thead>
<tr>
<th>Clinical Indication</th>
<th>Discovery</th>
<th>Pre-Clinical</th>
<th>Phase I/II</th>
<th>Phase III</th>
<th>Market Size/Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spine Fusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$3.0 B InFuse (MDT) =$&gt;500 M</td>
</tr>
<tr>
<td>Trauma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$11.2 B Prolia (AMGN) = $2.3 B Forteo (LLY) = $1.6 B</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Company Reports, NOF
Runx2 Protein is known as the “Master Switch” responsible for bone formation
BBC’s NELL-1 Protein helps committed cells grow better bone or cartilage (depending upon cell type)
rhBMP-2 targets many cells ---- May lead to tissue formation in undesirable anatomical locations
Novel Wnt Regulator NELL-Like Molecule-1 Antagonizes Adipogenesis and Augments Osteogenesis Induced by Bone Morphogenetic Protein-2.


*Nfatc2* is a primary response gene of NELL-1 regulating chondrogenesis in ATDC5 cells.


NELL-1 protein promotes bone formation in a sheep spinal fusion model.


The effect of NELL-1 and bone morphogenetic protein-2 on calvarial bone regeneration.


“The study of NELL-1 gene modified goat bone marrow stromal cells in promoting new bone formation”.


NELL-1 induced bone regeneration in calvarial defects.


“Human NELL-1 Expressed in Unilateral Coronal Synostosis.”

Clinically relevant sheep study demonstrated that rhNELL-1 increases the fusion rate and quantity of bone compared to sDBX.

<table>
<thead>
<tr>
<th>Result</th>
<th>Fusion Rate (uCT)</th>
<th>New Bone Vol (uCT)</th>
<th>New Bone Area (Histo Morph)</th>
<th>Bone Strength (Biomech)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rhNELL-1 Better than Control (sDBX)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Strong IP Barrier

- **13 issued patents with more than 200 claims covering:**
  - Molecular Structure - Composition
  - Manufacturing Process - NELL-1 protein expressed in mammalian & other systems
  - Field of Use – Use for promoting bone growth

- **Exclusive license to NELL-1 technology from UCLA for spine, trauma, and osteoporosis**

<table>
<thead>
<tr>
<th>Patent No.</th>
<th>Title</th>
<th>Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Patent No. 9,511,115</td>
<td>Pharmaceutical compositions for treating or preventing bone conditions</td>
<td>12/6/2016</td>
</tr>
<tr>
<td>U.S. Patent No. 7,052,856</td>
<td>NELL-1 enhanced bone mineralization</td>
<td>5/30/2006</td>
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<tr>
<td>U.S. Patent No. 7,687,462</td>
<td>Composition for promoting cartilage formation or repair comprising a NELL gene product and method of treating cartilage-related conditions using such composition</td>
<td>3/30/2010</td>
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<tr>
<td>U.S. Patent No. 7,776,361</td>
<td>NELL-1 enhanced bone mineralization</td>
<td>8/17/2010</td>
</tr>
<tr>
<td>U.S. Patent No. 7,833,968</td>
<td>Pharmaceutical compositions for treating or preventing bone conditions</td>
<td>11/16/2010</td>
</tr>
<tr>
<td>U.S. Patent No. 9,598,480</td>
<td>Recombinant NEL-like (NELL) protein production</td>
<td>3/21/2017</td>
</tr>
<tr>
<td>U.S. Patent No. 9,447,155</td>
<td>Isoform NELL-1 peptide</td>
<td>9/20/2016</td>
</tr>
<tr>
<td>U.S. Patent No. 9,974,828</td>
<td>Isoform NELL-1 peptide</td>
<td>5/22/2018</td>
</tr>
<tr>
<td>U.S. Patent No. 10,335,458</td>
<td>Pharmaceutical compositions for treating or preventing bone conditions</td>
<td>7/2/2019</td>
</tr>
</tbody>
</table>
$3 Billion Global Bone Graft Substitute Market

We estimate about 13% market share for BBC ~5 years after commercialization

Sources: Orthopedic Network News
We assume reasonable penetration rates of NELL-1 due to an attractive safety and efficacy profile, at a reasonable price.

<table>
<thead>
<tr>
<th></th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
<th>YEAR 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual WW Lumbar spine fusion procedures</td>
<td>500,000</td>
<td>500,000</td>
<td>500,000</td>
<td>500,000</td>
<td>500,000</td>
</tr>
<tr>
<td>Revenues</td>
<td>$46,875,000</td>
<td>$133,875,000</td>
<td>$191,250,000</td>
<td>$292,500,000</td>
<td>$397,500,000</td>
</tr>
<tr>
<td>% Growth</td>
<td>186%</td>
<td>43%</td>
<td>53%</td>
<td>36%</td>
<td></td>
</tr>
</tbody>
</table>
Future Valuation Estimates

We assume approximately $191M of revenues in second full year of commercialization, resulting in approximately 20% penetration in lumbar spine fusion procedures.
Product Development Milestones

- **2016**: Final Nell-1 cell line selected and synthesized
- **2017**: Commence Pivotal sheep study
- **2018**: Pilot sheep study data
- **2019**: Pivotal sheep study data
- **2020**: Commence OUS Phase I/II Clinical
- **2021**: Commence US Phase III Clinical
- **2022**: FDA Approval
Key Metrics

History
- September 19, 2014 – Reversed merge into shell corp.
- March 31, 2016 – Commenced trading on OTC QB
- July 16, 2018 Reverse stock split

Financial Metrics
- ~18M Diluted shares o/s **
- Raised $23M to date
- Company needs ~$20M to complete First in Man Trial

** 30M shares outstanding – 23M collateral shares + 11M convertible notes = 18M Diluted shares

Market Metrics
- ~500,000 lumbar spine fusions WW
- Multibillion market opportunity for spine indication
- BBC 5yr revenue estimate ~$400M
<table>
<thead>
<tr>
<th>TARGET</th>
<th>ACQUIRER</th>
<th>PURCHASE PRICE ($-m)</th>
<th>TTM REVENUES</th>
<th>PRICE/SALES</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragon Medical</td>
<td>NN Inc</td>
<td>$375</td>
<td>$138</td>
<td>2.7</td>
<td>Apr-18</td>
</tr>
<tr>
<td>Spinal Kinetics</td>
<td>OrthoFix</td>
<td>$105</td>
<td>$30</td>
<td>3.5</td>
<td>Mar-18</td>
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<tr>
<td>Exactech</td>
<td>TPG Capital</td>
<td>$625</td>
<td>$260</td>
<td>2.4</td>
<td>Oct-17</td>
</tr>
<tr>
<td>Dfine</td>
<td>Merit Medical</td>
<td>$98</td>
<td>$32</td>
<td>3.0</td>
<td>Jul-16</td>
</tr>
<tr>
<td>LDR Spine</td>
<td>Medtronic</td>
<td>$1,000</td>
<td>$166</td>
<td>6.0</td>
<td>Jun-16</td>
</tr>
<tr>
<td>Cayenne Medical</td>
<td>Zimmer Biomet</td>
<td>$150</td>
<td>$20</td>
<td>7.5</td>
<td>Apr-16</td>
</tr>
<tr>
<td>Ellipse Technologies</td>
<td>NuVasi</td>
<td>$410</td>
<td>$41</td>
<td>10.0</td>
<td>Jan-16</td>
</tr>
<tr>
<td>X-Spine</td>
<td>Xtant Medical</td>
<td>$86</td>
<td>$42</td>
<td>2.0</td>
<td>Jul-15</td>
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<tr>
<td>TEI Biosciences</td>
<td>Integra</td>
<td>$312</td>
<td>$63</td>
<td>4.9</td>
<td>Jul-15</td>
</tr>
<tr>
<td>OrthoView</td>
<td>Materialise</td>
<td>$12</td>
<td>$5</td>
<td>2.3</td>
<td>Oct-14</td>
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<tr>
<td>Tornier</td>
<td>Wright Medical</td>
<td>$1,500</td>
<td>NA</td>
<td>NA</td>
<td>Oct-14</td>
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<tr>
<td>Small Bone Innovations</td>
<td>Stryker</td>
<td>$375</td>
<td>$48</td>
<td>7.8</td>
<td>Jun-14</td>
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<tr>
<td>Biomet</td>
<td>Zimmer</td>
<td>$13,350</td>
<td>$3,200</td>
<td>4.2</td>
<td>Apr-14</td>
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<tr>
<td>ArthroCare</td>
<td>Smith &amp; Nephew</td>
<td>$1,700</td>
<td>$368</td>
<td>4.6</td>
<td>Feb-14</td>
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<tr>
<td>Solana Surgical</td>
<td>Wright Medical</td>
<td>$90</td>
<td>$15</td>
<td>6.0</td>
<td>Jan-14</td>
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<tr>
<td>OrthoPro</td>
<td>Wright Medical</td>
<td>$36</td>
<td>$6</td>
<td>6.0</td>
<td>Jan-14</td>
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<tr>
<td>Confluent Surgical</td>
<td>Integra</td>
<td>$265</td>
<td>$65</td>
<td>4.1</td>
<td>Jan-14</td>
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<tr>
<td>Aldagen</td>
<td>Cytomedix</td>
<td>$40</td>
<td>$5</td>
<td>8.0</td>
<td>Feb-12</td>
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<tr>
<td>Orthovita</td>
<td>Stryker</td>
<td>$316</td>
<td>$95</td>
<td>3.3</td>
<td>Jun-11</td>
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<tr>
<td>Osteotech</td>
<td>Medtronic</td>
<td>$123</td>
<td>$96</td>
<td>1.3</td>
<td>Nov-10</td>
</tr>
<tr>
<td>ApaTech</td>
<td>Baxter</td>
<td>$240</td>
<td>$60</td>
<td>4.0</td>
<td>Mar-10</td>
</tr>
</tbody>
</table>

**AVERAGE MULTIPLE**: 4.7

*Source: SEC documents and Company reports*
Value Proposition to Stakeholders

**Payors**
- Reduced costs
- Safer treatment — less complications
- Fewer reoperations

**Patients**
- Consumers more selective, demand better care
- Better safety profile
- Improved fusions and healing

**Physicians**
- Improved clinical outcomes will see physicians/health systems drive utilization
- Established market and reimbursement
Management Team

Jeffrey Frellick, CEO and President
- COO Life Science Enterprises
- 15 yrs. Med-Tech analyst, Canaccord, ThinkEquity, Lazard, Leerink
- Consultant, Boston Biomedical Consultants
- Regional Sales Mgr., Becton Dickinson PCD
- Laboratory Technologist, Clinical Pathology Facility

Deina Walsh, CPA, Chief Financial Officer
- Former partner in EFP Rotenberg LLP.
- Certified Public Accountant
- Accounting and financial functions, SEC reporting, pre and post-IPO compliance, SOX, regulatory compliance, internal controls. Debt and equity financings, and M&A.

Dr. Scott Boden, Chief Medical Advisor
- Professor of Orthopedic Surgery at Emory University School of Medicine
- Director of Emory Orthopedics & Spine Center
- Vice Chair of Orthopedics, CMO/CQO of The Emory University Orthopedics & Spine Hospital
- Emory Healthcare Physician Director of Strategy and Development for Orthopedics & Spine Programs
Don Hankey
*Chairman of the Board Bone Biologics / CEO Hankey Group*
Mr. Hankey holds his BA and post-graduate work from University of Southern California. He started his career at what became known as USB Paine Weber. Mr. Hankey acquired Midway Ford in 1972 and founded Hankey Investment Company in 1982 where he grew its portfolio in the financial services industry. The Hankey Group today is comprised of seven operating companies across the automotive, finance, technology, real estate and insurance industries.

John Booth
*CEO Spineology Inc.*
Mr. Booth has been CEO of Spineology since 2004. He previously held executive level positions at Phillips Plastic Corp, and INCSTAR Corp. as well as various financial and general management roles in the medical technology industry. Mr. Booth received a B.S. in accounting from Villanova and a MBA from Seton Hall.

Bruce Stroever
*Former CEO Musculoskeletal Transplant Foundation*
Mr. Stroever served as Chairman of Bone Biologics from 2012 - 2018 and was the President and CEO of MTF until 2018, where he joined in 1988 as General Manager. He previously held several positions at Johnson & Johnson’s Ethicon division. He received his B.E. in Mechanical/Chemical Engineering from Stevens Institute of Technology and Masters of Science in Bioengineering from Columbia University.

Bret Hankey
*President of Hankey Group*
Mr. Hankey brings more than 15 years of operating and board director experience to the BBLG board. Since 2000, Mr. Hankey has served in various capacities within the Hankey Group where he currently serves as President and is a member of the board of directors on all seven operating companies specializing primarily in the automotive, finance, technology, real estate and insurance industries.

Steve La Neve
*Former CEO and President of Bone Biologics*
Mr. La Neve brings 30 years of health care experience and leadership to Bone Biologics. Previously Mr. La Neve was CEO of Bone Biologics, Life Science Enterprises, and ETEX Corp. while holding divisional president roles at Medtronic and Becton Dickinson. He holds a B.S. in Health Planning from Penn State University and an MBA West Chester University.
2 Burlington Woods Dr, Suite 100
Burlington, MA 01803
781-552-4452

www.bonebiologics.com

OTC QB: BBLG