Spearheading the Global Market and Setting New Standards with World-leading Bio-technology

Cell Biotech is the pioneer in the Korean probiotics LAB (lactic acid bacteria) market. Since its launch in 1995, Cell Biotech has been constantly striving to acquire top-notch probiotics technology. It has cemented its leadership in probiotics and now commands the biggest domestic market share and is spearheading biotech product exports to more than 40 countries around the world. Cell Biotech has earned global recognition for its cutting-edge dual coating technology. Dual coating allows coating materials to be either strongly combined or separated according to pH levels in order for probiotics to safely reach the small/large intestines.

Leading Global Probiotics Specialist

Cell Biotech has grown into one of the world’s top five probiotics companies on the back of its technological prowess. It has commercialized probiotics LAB and come up with a one-stop solution covering the entire production process from strain development and testing for safety and functionality to fermentation, manufacturing and packaging of finished products, and marketing and distribution. Cell Biotech is building trust with consumers at home and abroad.

Successful Role Model Based on R&D

Cell Biotech is a first-generation venture company in Korea. Its core competitiveness lies in R&D backed by competent research personnel. More than 30% of the workforce holds a master’s or doctoral degree. Cell Biotech was designated as one of ‘World Class 300’ companies in 2015 by the Ministry of Trade, Industry & Energy (MOTIE) and the Small and Medium Business Administration (SMBA). Its Cellular Engineering Laboratory conducts research in diverse areas including strain DNA analysis and clinical testing. Based on collaboration with domestic and international university hospitals, Cell Biotech is contributing to the development of bowel disease treatments with its own strains through clinical applications such as IBS (irritable bowel syndrome), IBD (inflammatory bowel disease), and LGS (leaky gut syndrome). Probiotics is likely to lead next-generation well-being trends alongside steady growth of the health care industry. The market for probiotics LAB is becoming more segmented and will require specialized R&D capability. Manufacturing technology backed by R&D associated with science and medicine will be crucial for survival in the marketplace.

Improvement of Quality of Life

Cell Biotech is making ceaseless efforts to improve quality of life by investing more than 5% of revenue in R&D every year. Intestinal health is closely related to daily living patterns and our everyday surroundings. Under our motto “For better digestive health for all,” we will continue to strive to improve quality of life for people around the world in the 21st century.
**History of Cell Biotech**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Aug. Cellular Engineering Laboratory established (Korea Industrial Technology Association)</td>
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<tr>
<td></td>
<td>Oct. Approval for manufacturing of health supplementary foods and special nutritious foods (Ministry of Health &amp; Welfare) attained</td>
</tr>
<tr>
<td>1996</td>
<td>May Won the ‘Excellence Industrial Technology Award of Korea’ (Ministry of Commerce &amp; Industry)</td>
</tr>
<tr>
<td>1998</td>
<td>Jan. The 2nd production plant (finished product manufacturing-GMP facilities) constructed</td>
</tr>
<tr>
<td></td>
<td>Apr. Culture Biotech International established (sales unit)</td>
</tr>
<tr>
<td></td>
<td>Aug. Manufacturing license for pharmaceutical ingredients (Korea Food &amp; Drug Administration) attained</td>
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<tr>
<td></td>
<td>Oct. Designated as a venture company (Small &amp; Medium Business Administration)</td>
</tr>
<tr>
<td></td>
<td>Dec. Designated as an ‘Excellent Technology Company’ (Korea Technology Finance Corporation)</td>
</tr>
<tr>
<td>1999</td>
<td>Jan. Designated as one of the ‘Top 50 Venture Companies’ in Korea (Korea Economic Daily)</td>
</tr>
<tr>
<td></td>
<td>May Designated as one of ‘Promising Export SMEs’ (Small &amp; Medium Business Administration)</td>
</tr>
<tr>
<td></td>
<td>Dec. Designated as a Technology Development Demonstration Company (Korea Technology Finance Corporation)</td>
</tr>
<tr>
<td>2000</td>
<td>Apr. Kosher certification attained (USA)</td>
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<tr>
<td></td>
<td>Sept. Presidential Award for Best Biotech Venture Company in Korea (Ministry of Government Administration and Home Affairs) received</td>
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<tr>
<td></td>
<td>Nov. ISO 9001 certification attained (UK, BM TRADA)</td>
</tr>
<tr>
<td></td>
<td>Dec. BGNP certification attained (Korea Food &amp; Drug Administration)</td>
</tr>
<tr>
<td>2001</td>
<td>Jul. Designated as a venture company for ‘International Business Supporting Program’ (Small &amp; Medium Business Administration)</td>
</tr>
<tr>
<td>2002</td>
<td>Feb. Safety of DUOLAC™ and SAFELACTM approved by the FDA (USA)</td>
</tr>
<tr>
<td></td>
<td>Apr. HACCP certification attained (SIVOS, SGS)</td>
</tr>
<tr>
<td></td>
<td>Dec. Listed on KOSDAQ (Korean stock market)</td>
</tr>
<tr>
<td>2003</td>
<td>Mar. Dual-coated lactic acid bacteria selected as a ‘Next-Generation World-class Product’ (Ministry of Commerce, Industry &amp; Energy)</td>
</tr>
<tr>
<td>2004</td>
<td>Apr. Patent for dual coating LAB (Korea, Japan) registered</td>
</tr>
<tr>
<td></td>
<td>Jul. Halal certification attained (Korean Muslim Federation)</td>
</tr>
<tr>
<td></td>
<td>Aug. USD1 m. Export Award and Prime Minister’s Award for Top Export Company (Ministry of Commerce, Industry and Energy) received</td>
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<tr>
<td></td>
<td>Nov. USD1 m. Export Award and Prime Minister’s Award received</td>
</tr>
<tr>
<td>2005</td>
<td>Mar. Exemplary Taxpayer Award from Director of the National Tax Service on Taxpayers’ Day received</td>
</tr>
<tr>
<td></td>
<td>Oct. Exemplary Taxpayer Award (National Tax Service) received</td>
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<tr>
<td></td>
<td>Dec. GMP certification (Korea Food &amp; Drug Administration) attained</td>
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<tr>
<td>2006</td>
<td>Apr. Designated as an INNO-BIZ (innovative business)</td>
</tr>
<tr>
<td></td>
<td>Aug. Cell Biotech International (Denmark) established</td>
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<tr>
<td></td>
<td>Nov. USD1 m. Export Award received</td>
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<tr>
<td></td>
<td>Dec. Designated as ‘Advanced Technology Center’ (Ministry of Commerce, Industry &amp; Energy)</td>
</tr>
<tr>
<td>2007</td>
<td>May Grand prize at ‘Management of Technology Awards’ (Korea Management Association) received</td>
</tr>
<tr>
<td></td>
<td>Dec. Selected as ‘Next-Generation World-class Product Certification Company’ (Ministry of Commerce, Industry &amp; Energy)</td>
</tr>
<tr>
<td></td>
<td>Sep. Clinical trials for acute dermatitis, osteoporosis and IBS completed</td>
</tr>
<tr>
<td>2009</td>
<td>Apr.2010</td>
</tr>
<tr>
<td></td>
<td>May Exemplary Venture Award (Ministry of Strategy and Finance) received</td>
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<tr>
<td></td>
<td>May Exemplary Venture Award (Ministry of Knowledge Economy) received</td>
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<tr>
<td></td>
<td>Sept. Selected as a ‘Hidden Champion’ (Korea Export-Import Bank)</td>
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<tr>
<td></td>
<td>Nov. Patent granted for basic technologies related to colorectal cancer</td>
</tr>
<tr>
<td>2011</td>
<td>Apr. Designated as KRK ‘Free Hidden Champion’</td>
</tr>
<tr>
<td></td>
<td>May HACCP certification attained (UK, LRQA)</td>
</tr>
<tr>
<td></td>
<td>Nov. ISO 9001 certification attained (UK, LRQA)</td>
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<tr>
<td>2012</td>
<td>Apr. Renewed DUOLAC™ brand launched</td>
</tr>
<tr>
<td></td>
<td>Aug. API (active pharmaceutical ingredients) LH bacteria registered on DMF (Drug Master File)</td>
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<tr>
<td></td>
<td>Dec. Tyndallized LH bacteria granules registered on DMF (Drug Master File)</td>
</tr>
<tr>
<td></td>
<td>Patent granted for basic technologies related to colorectal cancer</td>
</tr>
<tr>
<td>2013</td>
<td>Oct. The 3rd plant (finished product production) constructed</td>
</tr>
<tr>
<td>2014</td>
<td>Sept. USD10 m. Export Award and Prime Minister’s Award received</td>
</tr>
<tr>
<td>2015</td>
<td>Mar. Gold Tower Order of Industrial Service Merit on 49th Taxpayers’ Day (Ministry of Strategy and Finance) awarded</td>
</tr>
<tr>
<td></td>
<td>Jun. Patent technology award “Chungmung Award” for utility model (Korean Intellectual Property Office) received</td>
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<tr>
<td></td>
<td>Jul. Technology award at the 2015 International Technology Conference and Symposium (Korean Society for Microbiology and Biotechnology) received</td>
</tr>
<tr>
<td></td>
<td>Jun. Selected as one of ‘World Class 3W’ (Small &amp; Medium Business Administration)</td>
</tr>
<tr>
<td></td>
<td>Sept. Selected as one of ‘Asia’s 280 Best Companies’ by 2015 Forbes Asia</td>
</tr>
<tr>
<td></td>
<td>Sept. ‘2015 South Korea Functional Food Company of the Year’ Award (Frost &amp; Sullivan) received</td>
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Why CELL BIOTECH?

Microbiology Specialist
Microbiology Specialists, Cell Biotech

Over 190 microbiologists at Cell Biotech are producing world-class products with leading microbial technology to improve the quality of people’s lives around the world.
Korean Probiotics

Cell Biotech isolates strains from Korea’s traditional fermented foods (kimchi, jeotgal, etc.) and feces of breast-fed infants. Cell Biotech has developed over 55 highly productive strains out of 10,000 probiotic strains.

Multi-strain Cocktail

According to a scientific paper published in an European academic journal titled 'Health benefits of probiotics: are mixtures more effective than single strain?', 75% of 16 studies show the effects of multi-strain probiotics are far superior to that of single-strain probiotics.

Before proceeding with clinical trials, single-strains that are particularly effective for certain diseases are selected through in vitro and animal testing. Then, blending tests, in which strains are mixed to find the best mixture, are conducted to determine the optimal mix ratio. Finally, clinical trials are carried out, where fecal analyses are conducted to check whether the number of probiotics in feces increased and determine if probiotics safely reached the intestine.

Patents for Probiotic Strain Formulation

- **COMPOSITION FOR PREVENTING OR TREATING IRRITABLE BOWEL SYNDROME**
  The invention is related to composition for the prevention or treatment of irritable bowel syndrome by maintaining stability of the intestinal microorganisms, which includes LA1 (KCTC 11906BP), LR5 (KCTC 12202BP), BF3 (KCTC 12199BP), BL3 (KCTC 11904BP), BG7 (KCTC 12200BP) and ST3 (KCTC 11870BP) (with their fermented broth) as active ingredients.

- **COMPOSITION FOR PREVENTING OR TREATING OSTEOPOROSIS**
  The invention is related to composition for the prevention or treatment of osteoporosis that includes: mineral compounds that consist of one or more calcium supplements and one or more magnesium supplements; and ST3 (KCTC 11870BP), LR3 (KCTC 11868BP) and LPC4 (KCTC 11866BP). The composition is applicable to drugs and foods that facilitate the absorption of calcium and minerals in the human body to inhibit decrease of mineral density in bones and prevents related side effects.

- **NEW LACTIC ACID BACTERIA STRAINS AND NEW LACTIC ACID BACTERIA STRAINS-CONTAINING COMPOSITIONS FOR PREVENTING OR TREATING DIABETES**
  The invention is related to composition for ST3 (KCTC 11870BP), LR3 (KCTC 11868BP), LPC4 (KCTC 11866BP) of lactic acid bacteria strains and any diabetes prevention and treatment compositions that include them. These lactic acid bacteria strains and composition are useful for preventing and treating diabetes as they are highly effective in lowering blood glucose levels, managing the size of livers of diabetic and non-pathologic for kidney.
Dual Coating Technology

Dual coating technology has been patented in Korea, Japan and Europe. It holds lactic acid bacteria in the stomach and releases them in the intestine. Probiotics DUOLAC® protects the intestinal health of your family.

Do you know why dual coating of lactic acid bacteria is important? Lactic acid bacteria are doubly coated since the stomach and intestines are two different organs. Please make sure to choose dual-coated probiotics DUOLAC® when you buy probiotic products.

Dual coating matrix diagram

DUOLAC® improves the stability of lactic acid bacteria with the coating layers of protein and polysaccharide to help them survive stomach acid and reach the intestine.

Protein layer
- pH-dependent release system with a protein and peptide matrix
- Delivers lactic acid bacteria to the intestine safely and help them proliferate in the intestine

Polysaccharide layer
- Protects lactic acid bacteria from moisture, heat and mechanical pressure
- Maintains stability during manufacturing process, room temperature storage and distribution

Holding lactic acid bacteria in the stomach

Releasing lactic acid bacteria in the intestine

Our patented dual coating technology protects lactic acid bacteria from the attack of gastric acid.

The dual coating is dissolved quickly in the intestine so that lactic acid bacteria can colonize and proliferate in the intestine for intestinal health.
Dual Coating Technology

Dual coating probiotics DUOLAC® improved stability through protein coating and polysaccharide coating to deliver lactic acid bacteria to the intestine alive.

Efficacy of Dual Coating Technology

Probiotic lactic acid bacteria are easily destroyed during manufacturing process, room temperature storage, distribution and consumption due to their vulnerability to air, heat, mechanical pressure, moisture and gastric acid and bile salt. Cell Biotech developed the world’s first dual coating technology comprised of protein and polysaccharide to minimize destruction of lactic acid bacteria during manufacturing process and distribution. In particular, we have striven to increase the survival rate of lactic acid bacteria in the intestine, and the technology has been globally recognized and obtained patents in Korea, Europe and Japan.

※ Patent numbers (Korea: 0429495, Japan: 3720780, Europe: 1514553)

One Stop Solution

In order to build consumer confidence in all products produced by Cell Biotech, a one stop solution has been established that covers the whole process from strain development, experiments on safety and efficacy, including DNA and animal testing, fermentation, production and packaging of finished products, and distribution and marketing tailored to probiotic products.
Cell Biotech has served customers in over 40 countries across the world with different races, eating habits and cultures for more than two decades. We have developed into a global company specializing in probiotics based on product safety, superior technology, and various certifications and patents acquired at home and abroad.

Cell Biotech International (CBTI) is a company dedicated to sales and marketing of probiotics in all global markets except Europe.

Cell Biotech International A/S (CBTI Denmark) is a company dedicated to sales and marketing of probiotics in Europe.
Basic Research on Lactic Acid Bacteria

1. DNA analysis technology
- Strain identification technology based on DNA analysis
  - Identification (O-PDR)
  - Pulse Field Gel Electrophoresis (PFGE)
- Technology of extraction of genomic DNA of lactic acid bacteria from feces
- Technology of quantification of strains from extracted genomic DNA
- Technology of qualitative analysis of distribution of intestinal microflora based on Denaturing Gradient Gel Electrophoresis (DGGE)

2. Strain isolation and optimization technology
- Technology of isolation of lactic acid bacteria from human feces
- Strain optimization technology
- Technology of optimization of culture media and conditions for each strain
- Technology of improvement of stability of lactic acid bacteria strains (cooling technology)

3. Process analysis and purification technology
- Label analysis technology using Ultra Performance Liquid Chromatography (UPLC)
- Strain cultivation monitoring technology using various detectors (UV, FLD, RI, ELSD)
- Various analysis technology related to bioactive cells
  - Normal cells, cancer cells, immune cells
  - Various analysis technology related to bioactive cells
- Biochemical analysis of blood
- Pathological analysis of tissue
- Analysis of biological marker

Applied Research on Lactic Acid Bacteria

1. Animal testing
- Technology of designing models of inflammatory bowel disease for various diseases
- Designing models of inflammatory bowel disease, atopic dermatitis, obese animal
- Anti-cancer related design (solid cancer, genetically engineered animals)
- Technology of cultivation of animal cells and analysis of cell activity
  - Normal cells, cancer cells, immune cells
  - Various analysis technology related to bioactive cells
- Biochemical analysis of blood
- Pathological analysis of tissue
- Analysis of biological marker

2. Study on alleviation of diseases by administration of Cell Biotech's probiotics
- Anti-inflammatory effect: Inhibition of inflammatory cytokines and increase of anti-inflammatory cytokines through in vitro administration
- 5) Inhibition of diarrhea
- 7) Anti-cancer effect using proteins extracted from lactic acid bacteria
- 9) Alleviation of diabetes

3. Others
- Development of antibiotic alternatives
- Development of antibiotics for oral administration
- Technology of analysis of mechanism for anti-cancer drug efficacy
- Technology of protein absorption system for colon cancer treatment
- Technology of development of cosmetic ingredients using bacteriocins extracted from lactic acid bacteria
- Manufacturing technology of fermented herbal medicine using lactic acid bacteria
- Technology of application of lactic acid bacteria culture media using yeast fermentation
- Prevention and alleviation of skin inflammations using lactic acid bacteria from yeasts
- Prevention and treatment of non-invasive infection using lactic acid bacteria

Cellular Engineering Laboratory of Cell Biotech Specializes in Probiotic Lactic Acid Bacteria for the Intestinal Health of People around the World

Cell Biotech carries out various research projects on new medical benefits, immune control function, and bioactive substances of lactic acid bacteria. We have expanded the application of lactic acid bacteria to health functional food, cosmetics, veterinary medicines, and biotech drugs. In particular, we have conducted in-house animal testing and clinical trials with universities, government-sponsored research centers and universities hospitals at home and abroad in order to develop treatments for irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), leaky gut syndrome (LGS), colon cancer, and atopic dermatitis through research on immunomodulatory effects of lactic acid bacteria.
Leading Probiotics Company with Cutting-edge Technology and Patents

- **Probiotics coating technology**
  1. Manufacturing method of probiotic coated lactic acid bacteria (Korea)
  2. Manufacturing method of dual-coated lactic acid bacteria powder using protein and polysaccharide (Korea, Japan, EU)
  3. Manufacturing method of triple-coated lactic acid bacteria, coating method of nanoparticles, and related products thereof (Korea, Japan, EU)
  4. Multi-layer coated lactic acid bacteria and its manufacturing method (Korea)

- **Probiotic lactic acid bacteria composition for prevention and treatment**
  1. Novel lactic acid bacteria with immunity enhancing effects (Korea)
  2. Novel lactic acid bacteria and their composition for prevention and treatment of diabetes (Korea)
  3. P14 protein with anti-allergic activity and pharmaceutical composition thereof (Korea)
  4. Composition for prevention and treatment of osteoporosis (Korea)
  5. Anti-cancer pharmaceutical composition (Korea)
  6. Composition for prevention and treatment of irritable bowel syndrome (Korea)

- **Antimicrobial substances of probiotics**
  1. Manufacturing method of antimicrobial broth concentrate using Lactococcus lactis CBT-19 and cosmetic preparation thereof (Korea, Japan)
  2. Manufacturing method of antimicrobial substances using Pediococcus pentosaceus that produces antimicrobial substances inhibiting the growth of Helicobacter pylori and Listeria monocytogenes and health functional food and drugs thereof (Korea, Japan)
  3. Tyndallized antimicrobial lactic acid bacteria and manufacturing method thereof (Korea, China)

- **Others**
  1. Manufacturing method of dosage form containing lactic acid bacteria powder and novel application of lactic acid bacteria powder (Korea)
  2. Novel plasmid extracted from Pediococcus pentosaceus and its application (Korea)

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**Awards**

- **May 1996** Excellence Award at New Tech Korea
- **Sept. 2000** Presidential Award for Best Biotech Venture Company in Korea
- **May 2003** Korea World-Class Product Award (Ministry of Commerce, Industry & Energy)
- **Apr. 2004** Patent on dual-coated lactic acid bacteria powder using protein and polysaccharide (Patent No. 0429495)
- **Nov. 2004** Prime Minister Award for 1 Million Dollar Export
- **Mar. 2005** Exemplary Taxpayer Award from National Tax Service
- **Apr. 2006** Designated as Innovative Business (NNO-BIZ) by Small & Medium Business Administration (SMBA)
- **Nov. 2006** Prime Minister Award for 3 Million Dollar Export
- **May 2007** Grand Prize at Global Standard Management Awards from Korea Management Association
- **Dec. 2007** Korean World-Class Product Award 2007 (Ministry of Commerce, Industry & Energy)
- **Nov. 2008** Prime Minister Award for 5 Million Dollar Export
- **Mar. 2010** Exemplary Taxpayer Award from Ministry of Strategy & Finance
- **Mar. 2010** Technology Innovation of the Year Award (First & Sullivan)
- **May 2010** Exemplary Venture Company Award (Ministry of Knowledge Economy)
- **Sep. 2010** Hidden Champion Award from Korea Export-Import Bank
- **Nov. 2010** Prime Minister Award for 10 Million Dollar Export
- **Apr. 2011** Hidden Champion Award from KRX
- **May 2012** Removal of DGOCAL™ product line
- **Sept. 2013** The 3rd plant (finished product production) constructed
- **Sept. 2014** Best Small-Cap Company IR
- **Mar. 2015** Gold Tower Order of Industrial Service Merit on the 48th Tax-Payers Day (Ministry of Strategy & Finance)
- **Jun. 2015** Patent Technology Prize and Chungmugong Award in Utility Model Category (Korean Intellectual Property Office)
- **Jul. 2015** Designated as World Class 300
- **Sept. 2015** 2015 Frost & Sullivan South Korea Functional Food Company of the Year Award
Dual-coated lactic acid bacteria DUOLAC® products are segmented by age and purpose so that our customers can easily select products based on their preferences and intestinal conditions.
Cell Biotech has made continuous efforts for the past 20 years to make the best products with new technologies such as strain isolation, dual coating, large scale fermentation since its inception in 1995, and has grown into a leading biotech company based on world-renowned advanced probiotics technology. We promise you that we will spare no effort to become a specialized biotech company in 21st century that improves quality of life for people around the world by expanding our operations beyond probiotics to new biotech business fields such as antimicrobial substances and new pharmaceutical products.