Briefing session regarding Life Sciences business

July 5 2016

JSR Corporation
Agenda

1. Position of the Life Sciences business in JSR

2. Business Overview
   2.1 Business Strategy
   2.2 Product
   2.3 Affiliated companies

3. Further business development
JSR Life Sciences as a Business Unit and Brand

• JSR Life Sciences was established as a global business unit and given it’s own logo and brand identity in April 2016
• New JLS Logo Design
  • A thorough competitive analysis was conducted for the design of the new JLS logo.
  • The colors selected were determined to be unique in the current marketplace but the industry is clearly comfortable with blues and greens
  • The logo “bug” (round dot preceding JLS) reflects JSR’s deep polymer expertise, while also evoking collaboration, connection and process flow.
  • The JLS Bioprocess division has adopted the tagline of *Innovation from Lab Through Launch* which was market tested by an outside research firm.
JSR Group companies that collaborate to comprise JSR Life Sciences

The new JSR Life Sciences brand and business unit encompass all global life sciences-focused businesses and departments.
1. Position of the Life Sciences business in JSR
Life sciences as the **third pillar** following petrochemicals and fine chemicals

---

**Core businesses**

**Petrochemicals**
- Petrochemical Products
- Electronic Materials

**Fine Chemicals**
- Display Materials
- Optical Materials

**New businesses**
- Biomedical Materials
- Environment and Energy
JSR’s business fields by products

- ELECTRONIC-MATERIALS
- ELASTOMERS
- OPTICAL-MATERIALS
- PERFORMANCE-CHEMICALS
- THERMOPLASTIC-ELASTOMERS
- EMULSION
- LITHIUM ION CAPACITOR

LIFE SCIENCES
- Magnetic beads
- Non-Magnetic beads
- IVD Reagents
- Chromatography Media
- Biopharma CDMO
LS Business Arc- Finding the Value

● **Entry point is our materials technology**
  • JSR has manufactured particles (beads) for 30 years
  • We know high purity, high quality, precise control manufacturing.
  • We know how to control physical and surface properties
  • We know how to manage Quality systems
  • We know how to support customers

● **Our aim is to move upstream**
  • Adding function for new products: Protein A, Exocap, etc. (details to follow)

● **Add applications, services, industry expertise and market windows**
  • Acquisition of KBI and MBL
  • Actively looking for further opportunities

● **Prepare for the future- new technologies and new business models**
  • Digital Health, Big data, Pay for performance, IOT (sensors)
Main contents of life science businesses

① Bioprocess field
- Chromatography materials for antibody drug purification
  Protein A binding particles, ion-exchange membrane filter, etc.
  Contract development and manufacturing of biopharmaceutical products (Headquarters: North Carolina, USA)

Development and Manufacturing of protein A affinity products. Develop bioprocess product portfolio

② Diagnostics/research reagent field
- Diagnostic/research reagents
  Development, manufacturing and marketing of diagnostics/research reagents (Headquarters: Nagoya, Japan)

- Diagnostic intermediates, polymers
  Polymer particles, magnetic particles, etc.
  R&D, manufacturing and marketing of diagnostic intermediates (Headquarters: Beijing, China)
  Development and Manufacturing of magnetic and non-magnetic particles
The acquisition of KBI Biophrama (KBI) and MEDICAL & BIOLOGICAL LABORATORIES CO.,LTD.(MBL) has expanded our business opportunities, raising the possibility that the LS business will achieve net sales of 40.0 billion yen to 50.0 billion yen in 2020. We will accelerate the growth of the LS business using these companies as a vehicle and aim to bring the business segment into the black in around two years.
2. Overview of the business
   2.1 Business Strategy
JSR has expanded its business fields from petrochemicals to fine chemicals. In addition to such expansion, JSR is constantly reinforcing its existing core technologies while also developing new ones. In particular, high polymer chemistry supports all JSR’s businesses and remains a key area for the company.
Core technologies supporting JSR’s businesses:

Cleaning/precision purification technology cultivated in our semiconductor materials business

Similarity between semiconductor material technology and biopharmaceutical/diagnostic product related material technology

① Cleaning technology
   → Prevention and removal of contamination with foreign substances

② Advanced quality control technology
   → Data management of variation between lots, etc., compliance with GMP

③ Strict process change control
   → A broad range of Data management and certification technique, such as raw materials, manufacturing processes and quality examinations

Possibility that semiconductor material technology will increase competitiveness and promote differentiation
Medical trends and JSR’s life science business fields

- Considering the medical trends (individualized medicine, from treatment to prevention), JSR focuses on **biopharmaceuticals** and **advanced diagnostics**.
- In cooperation with hospitals and physicians, JSR develops products and services to meet practical needs in the clinical setting.

### Medical Trends

- **Personal medicine** (improvement of efficiency)
  - Tailor-made drugs (Biopharmaceuticals)
    - Limited adverse drug reactions
    - Excellent efficacy (Meeting individual needs)
- **From treatment to prevention**
  - Companion diagnostics
    - Genetic diagnostics
  - Early diagnosis of disease
    - Disease prevention
    - Control of aggravation
  - Monitoring and banking of biological information
- **Digitalization**
  - Digital health
- **Advanced diagnostics**
  - Biopharmaceuticals
- **Digital health**
  - Diagnostic intermediate business etc... (China)

### Advanced Regions
- Advanced regions including Europe and the USA
  - Prolongation of healthy life expectancy
  - Healthcare cost containment

### Emerging countries
- Growing economic power is enabling the establishment of healthcare and hygiene management systems.
- Technologies widely used in advanced countries are spreading in the markets.
- Imported technologies/products are being replaced by domestic technologies/products.

### Medical needs
- Pharmaceutical companies
- Hospitals/physicians/laboratories
In pharmaceuticals, the global trend is shifting from R&D of low-molecular compounds to R&D of biopharmaceuticals using genetic recombination technology.
Developed countries: Raising awareness of prognosis/preventive medicine.
Developing countries: Expanding healthcare system and health management.
⇒ Growth trends of the diagnostic drug market are different in developed and developing countries, but both markets are expected to grow; simple checkups/diagnostics in clinics or at home, efficient checkups/diagnostics in medical institutions or test centers.

【Transition of global diagnostic market (2011-2022)】

Growth rate of the global diagnostic market
CAGR+9.7%

Source: Visiongain.com 2012
Together with its group companies and strategic partners, JSR is engaging in diverse businesses ranging from seeds and functional materials to products meeting final needs in the medical field.

Assurance of technological seeds and necessary functions through M&A, investment and partnership.

Diagnostics
Translational Research
Biopharmaceuticals

JMLF (Venture fund)

ORGANOGENIX

Application of antibody technology
Development of purification materials/devices
Contract development/manufacturing of biopharmaceuticals

J&W Beijing Biotech Co., Ltd.

JSR LSC

MEDICAL & BIOLOGICAL LABORATORIES Co., Ltd.

JSR-Keio University Medical and Chemical Innovation Center (Scheduled to open in 2017)

Physician/hospitals
Pharmaceutical companies

KBI Biopharma
CMIC JSR Biologics Co., Ltd. (CJB)
Development of global organization

- We have established an organizational framework of the biopharmaceutical and diagnostic/research reagent drug businesses and have newly established the Life Sciences Division in JSR. We have placed an American as General Manager of the Life Sciences Division to unitarily control the business, including overseas bases.

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)

JSR Micro, Inc.
- Diagnostic/research reagent materials
  (sales and marketing)
- Bioprocess materials
  (applications center of excellence, sales, marketing)

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)

JSR Micro, Inc.
- Diagnostic/research reagent materials
  (sales and marketing)
- Bioprocess materials
  (applications center of excellence, sales, marketing)

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)

JSR Micro, Inc.
- Diagnostic/research reagent materials
  (sales and marketing)
- Bioprocess materials
  (applications center of excellence, sales, marketing)

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)

JSR Micro, Inc.
- Diagnostic/research reagent materials
  (sales and marketing)
- Bioprocess materials
  (applications center of excellence, sales, marketing)

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)

JSR Micro, Inc.
- Diagnostic/research reagent materials
  (sales and marketing)
- Bioprocess materials
  (applications center of excellence, sales, marketing)

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)

JSR Micro, Inc.
- Diagnostic/research reagent materials
  (sales and marketing)
- Bioprocess materials
  (applications center of excellence, sales, marketing)

J&W Beijing Biotech Co., Ltd.
*JSR ownership: 75%
Established on Apr. 1, 2012
- Diagnostic reagent materials
  - Diagnostic intermediates
    (marketing/manufacturing/R&D in China)

Beijing B&M Biotech Co., Ltd.
※Subsidiary of MBL
- Diagnostic/research reagent material (distribution)
- Contract analysis/manufacturing of antigens

JSR Life Sciences Corporation (LSC)
Established on Apr. 1, 2012
- Diagnostic/research reagent materials
  (manufacturing/distribution/R&D)
- Bioprocess materials
  (manufacturing/distribution/R&D)
2. Overview of the business

2.2 Product
What are antibody drugs?

- **Biopharmaceuticals** = Pharmaceuticals manufactured using the latest biotechnology
- **Antibody drugs** = Representative biopharmaceuticals

### Antibody drugs

- Using the human body’s own immune system
- Highly effective in treating cancer and refractory diseases (Targeting causative factors)
- Limited adverse drug reactions
- Manufactured by biosynthetic methods including cell culture (Complicated manufacturing processes)

### Conventional drugs

- Consisting of chemical substances each comprising tens of atoms (small molecule compounds)
- Having certain therapeutic effect on every patient
- Extremely potent drugs can be hazardous and cause adverse reactions
- Manufactured by artificial synthesis methods (Simple manufacturing processes)
Many microorganisms and cells are cultured so that many pharmaceutical ingredients can be biosynthesized.

Pharmaceutical ingredients created by microorganisms and cells are collected from the culture fluid for purification.

What is a column? A cylinder through which the fluid to be purified passes.

What is media? As media, particles are put in a column for antibody drug purification to facilitate the collection of antibodies in the fluid.

Fields where A3 product (JSR’s bioprocess Material, media for purification columns) are used.
**1. Bioprocess field** Protein A media particle

**Amsphere™ A3** (Name of JSR’s product)

- **JSR industrial beads technology**
- **Magnified surface**

**Porous particles technology** + **Surface modification technology** (Polymer) + **Recombinant protein technology**

Introducing the technology as In-house technology in collaboration with external research institutions

**Protein A media particle**

- **Particles are packed in the column. In the neutral condition, the antibody solution is added so that protein A can capture the antibodies.**
- **Impurities are rinsed off with the washing buffer so that the antibodies remain.**
- **An acid solution is passed through the column so that the antibodies can be eluted and collected.**

**Essential item in the antibody drug manufacturing process.**

**Accumulated technology in diagnostic beads area**
② Field of diagnostic/research reagent
What are diagnostics?

✓ **In Vitro Diagnostics; IVD**

IVDs are not administered directly to patients but are used for diagnosing diseases. They are reagents used for examining blood, urine, feces and saliva.

✓ **Research reagents (in the field of life science)**

Research reagents are used in laboratories where disease information is collected and analyzed.
Polymer particle technology has been used to establish diagnostic/research particle business projects.

**Diagnostic beads**
- Latex diagnostic beads
- Diagnostic magnetic beads

**Research reagent**
- mRNA refining reagent
- Virus nucleic acid extraction reagent
- Avidin beads
- Low nonspecific absorbed beads

**Medical beads**

JSR bead technologies
- Nonmagnetic beads
- Magnetic beads

Established as a business project in 1981
Established as a business project in 2000

Combination of surface quality modification technology and biomaterials

⇒ Expansion of scope of products and creation of new value
② Field of diagnostic/research reagent
JSR’s beads for diagnostic reagent

**Magnosphere™** (Name of JSR’s product)
-Magnetic beads for diagnostic reagent

**Magnosphere™** is used as follows:
(chemiluminescence enzyme immunoassay system)

Using magnetic beads immobilized by antibodies that react to markers, such as antigens,
Separating the markers with magnets after capturing the markers with the magnetic beads,
Quantifying the markers by the intensity of chemical luminescence

**IMMUTEX™** (Name of JSR’s product)
-Latex beads for diagnostic reagent

**IMMUTEX™** is used as follows:
(immuno-nephelometry)

Using polymer beads immobilized by antibodies that react to markers, such as antigens,
Quantifying the concentration of antigens by changes in light transmittance due to aggregation reactions via the antigens
② Field of diagnostic/research reagent
JSR’s beads for diagnostic reagent

ExoCap™ (JSR’s product name)
MBL’s main products are diagnostic reagents for autoimmune disease.

■ Domestic market of the Immunoserological test
Total: about 180 billion yen

■ Domestic market of the diagnostic reagent
Total: about 370 billion yen

What is autoimmune disease?
A pathological state arising from an abnormal immune response of the body to substances and tissues that are normally present in the body. (Ex. Rheumatoid arthritis)

MBL has a variety of diagnostic reagents, such as systemic autoimmune disease and organ-specific autoimmune disease.

Source: FUJI KEIZAI CO., LTD. “2013 clinical testing market No.1, No.4”
Field of diagnostic/research reagents

R&D technology of the high performance antibodies is MBL’s source of competitiveness

MBL’s basic development technology of the monoclonal antibodies

Antibody modification
- Chimera/humanized antibody
- scFv/Fab/F(ab)’2
- Diabody/Minibody
- Affinity maturation

MoAb
- Fusion method
- SPYMEG
- Phage display

Screening method
- Many Know-How's

Immunized animal
- Diseased mice
- KO mice
- Rat
- Rabbit
- Guinea pig
- Chicken
- Hamster

Method for immunization
- Many Know-How's

Artificial Lymph Node

Antigen design
- Retrieval system
- Immunogenecity enhanced antigen
- 3D modelling

Antigen preparation
- Synthesized peptide
- Baculovirus / E. coli /Animal cell expression system
- Liposome
2. Overview of the business

2.3 Affiliated companies
KBI Biopharma Inc.


No. of employees: approximately 400 (as of Dec. 31, 2015)
CEO: Joe MacMahon
Centers: Durham, North Carolina, USA (headquarters, plant), Research Triangle Park, North Carolina (development center), Boulder, Colorado (Microbial plant, acquired from Merck in May 2014)

Durham Facilities, NC  RTP Facilities, NC  Boulder Facilities, CO

Capital ties and positioning as a JSR group company

Composition of stockholders
JSR : 51%
INCJ : 44%
CMIC : 5%

Innovation Network Corporation of Japan (INCJ) provided effective instructions based on its M&A experience

Solutions can be provided for the processes from development to manufacturing of biopharmaceuticals through KBI’s contract services and JSR’s purification material technologies.

Materials for biopharmaceutical purification (Amsphere A3)
KBI’s CDMO business

- KBI provides a full range of biopharmaceutical process development/manufacturing services
- KBI continues to rapidly expand its business (>CAGR 25%)

<table>
<thead>
<tr>
<th>Customers’ drug development processes</th>
<th>Exploration, research</th>
<th>Nonclinical/process development</th>
<th>Clinical study</th>
<th>Application, approval</th>
<th>Commercial manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biopharmaceutical CDMO’s services</td>
<td>Cell Line Development</td>
<td>Process Development</td>
<td>Analytical &amp; Formulation</td>
<td>Clinical MFG</td>
<td>Commercial MFG</td>
</tr>
<tr>
<td>KBI’s services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio-venture companies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emerging bio-venture companies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major pharmaceutical manufacturers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Globally providing industry-leading process development and manufacturing services for more than 250 customers

Providing a full range of process development/property analysis/manufacturing services for each group of customers
Headquarters: Nagoya, Aichi  Established in 1969
Capital: 4,482,930,000 yen
No. of stocks issued: 26,059,000
No. of employees: 277 (as of Mar. 2015) (MBL Group: 440)
Business offices: Tokyo, Osaka, Nagoya, Fukuoka, Sapporo
Ina Research Institute (Ina City/Komagane City, Nagano)
  • GMP plant, R&D laboratory
  • ISO13485 certified (2006)
  Clinical diagnostics for autoimmune diseases: 60%
  Basic research reagents: 30%
  Contract manufacturing, etc.: 10%
R&D expenses: 16.2% (proportion of sales)
MBL International Corporation (MBLI)

- Established in 1993
- Headquarter: Massachusetts
- Capital: 5.8M$
- Sales: 7.3M$ (as of CY2015)
- No. of employees: 24
- Businesses: Import/purchase & sales of RUO products

・JSR Micro, Inc. turned MBLI into its consolidated subsidiary by acquiring a majority share (51%) of MBLI on Apr 2016.

MEDICAL & BIOLOGICAL LABORATORIES CO., LTD.
※JSR ownership as of Oct. 2015: 51%
Research/manufacturing/marketing of research reagents/diagnostics

JSR Micro, Inc.
・Diagnostic reagent materials (marketing/R&D in North America)
・Europe - Advanced medical market

MBL International Corp
*JSR Micro, Inc. ownership: 51%
Manufacturing/research/marketing of research reagents/diagnostics
JSR Life Sciences Corporation

- Address: 25 Miyukigaoka, Tsukuba, Ibaraki
- Business: R&D and manufacturing of life science related products
- Investment ratio: JSR Corporation 100%

Marketing operations were transferred to the Life Science Division, JSR Corporation, its parent company, on Apr. 1, 2016.
J&W Beijing Biotech Co., Ltd.

- Joint venture company by JSR and Beijing Wantai Biological Pharmacy Enterprise Co., Ltd.
- Established in April, 2012

Investigation ratio:

<table>
<thead>
<tr>
<th></th>
<th>2012.4</th>
<th>2014.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSR</td>
<td>60%</td>
<td>75%</td>
</tr>
<tr>
<td>Wantai</td>
<td>40%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Business focus: R&D, manufacturing and sales of diagnostics intermediates

Address: Science Park Road No.31, Changping District, Beijing.

Completion Ceremony → (April, 2012)
China Development of the Life Sciences business

Business development into China based on JSR group network

J&W Beijing Biotech Co., Ltd.
JSR Corp. Life Sciences Div.
JSR (Shanghai) Co., Ltd.
Beijing B&M Biotech Co., Ltd.
MEDICAL & BIOLOGICAL LABORATORIES CO., LTD.
3. Further business development
Scheduled to open in Oct. 2017 (Shinanomachi Campus of Keio University)

By conducting joint research projects with the Keio University School of Medicine and Keio University Hospital, JSR can identify practical needs in the clinical setting and conduct state-of-the-art product development and clinical research.

The joint research projects will cover the following fields: precision medicine, stem cell biology & cell based medicine, and designed medical devices.
JKiC Joint Research Building

- The new three-story building with a basement has a total floor area of 3,700 m² (under construction).
- The new building will include: chemistry laboratories and common measurement laboratories (basement), networking/exchange space, industry-university cooperation support office, conference rooms (1F), and biochemistry laboratories (2F and 3F).

Under construction at the north end of the Shinanomachi Campus of Keio University
JKiC is collaborating in the following fields:

- **Collaboration fields (Flag themes):**
  - Precision Medicine
  - Microbiome
  - Stem Cell Biology and Cell Based Medicine
  - Designed Medical Device
  - Supporting drug discovery
  - Diagnostic agents
  - 3D processing devices
  - Particle technology
  - Synthesis technology
  - Antibody

**Direction of Keio University School of Medicine**
Appropriate/rapid diagnosis/treatment/Drug discovery for contribution to healthy longevity

**JSR Group's technology field**
Thank you

http://www.jsrlifesciences.com/