

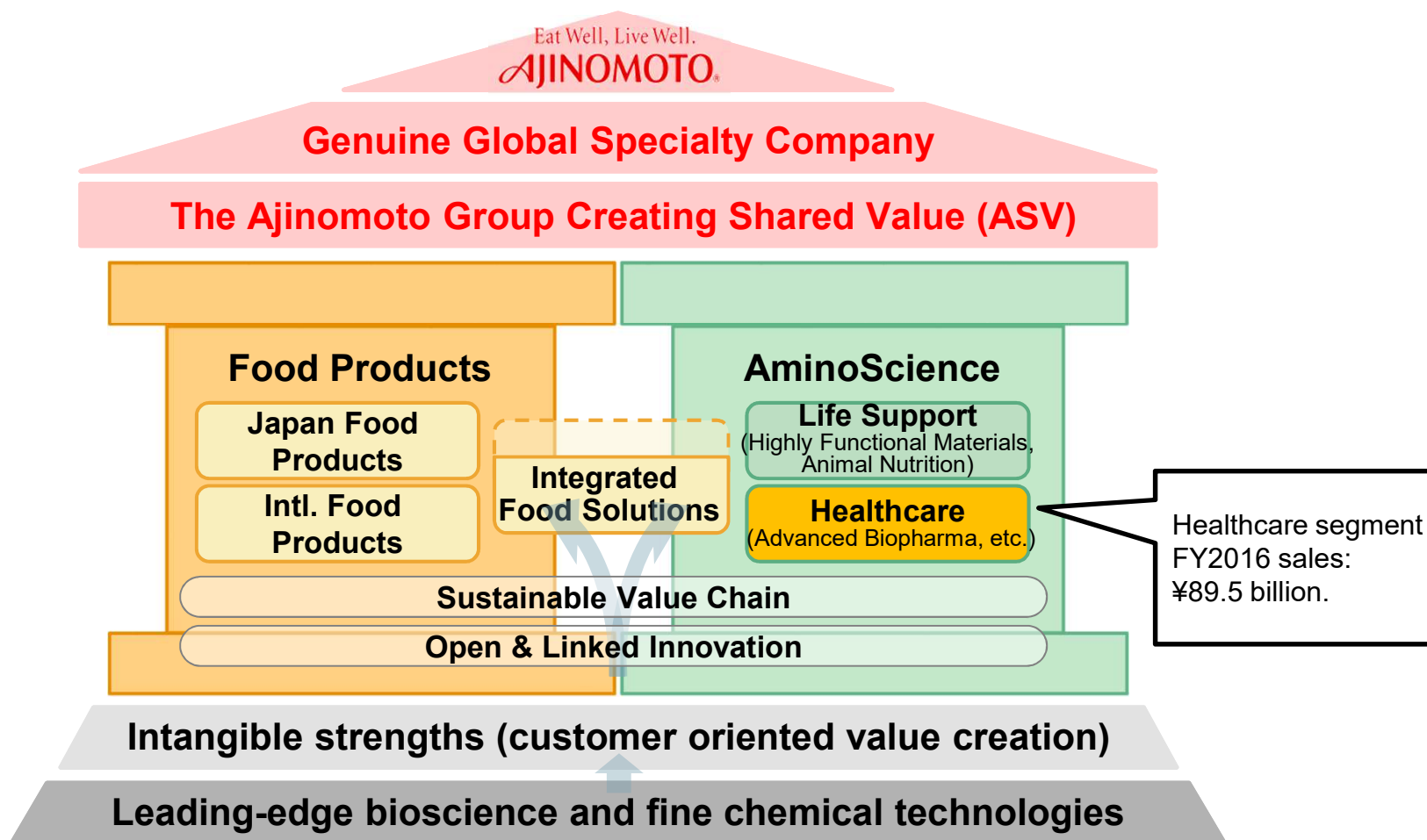
Ajinomoto's Pharma-related Business employing Leading-Edge Bioscience and Fine Chemical Technologies

June 8, 2017

Hiroshi Fukushi

Member of the Board & Corporate Senior Vice President
General Manager, AminoScience Division

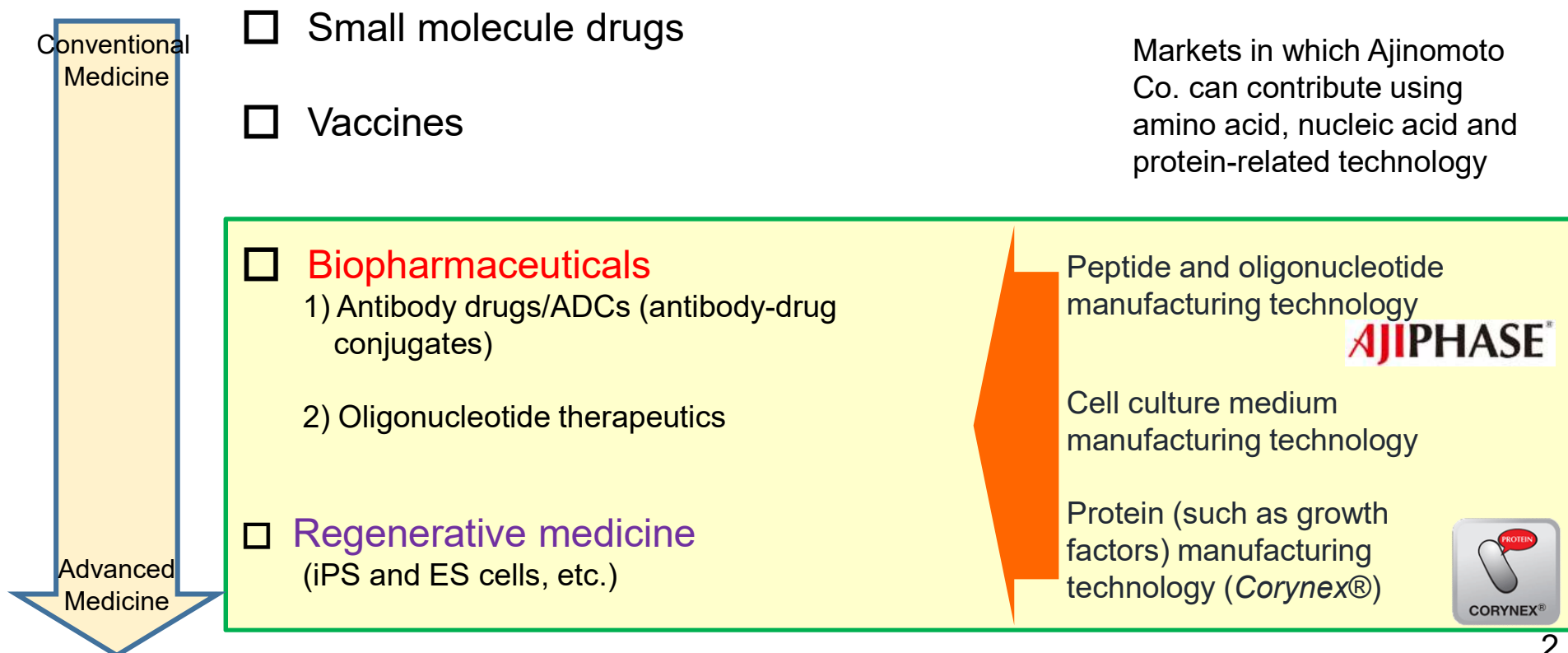
The Segment I Will Talk About Today



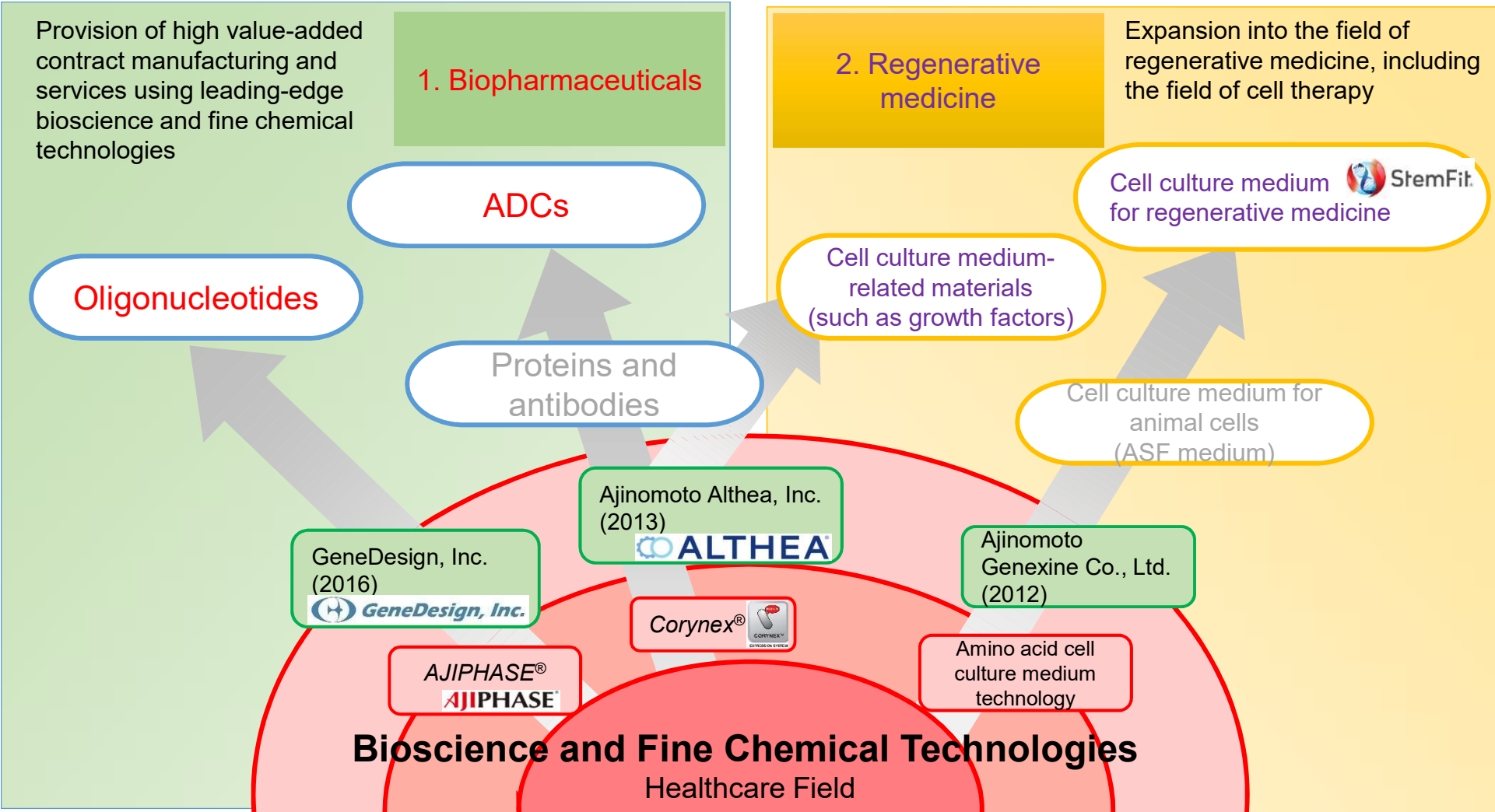
What are “Advanced Bio Pharma related business” as Defined by Ajinomoto Co.?

Advanced Bio: Biomaterials, such as amino acids, peptides and proteins, and the application of their manufacturing technology; areas in which we have expertise

Pharma-related business: Production of pharmaceuticals, material development and utilization



Evolution of “Advanced Bio Pharma-related business” in Ajinomoto Co.

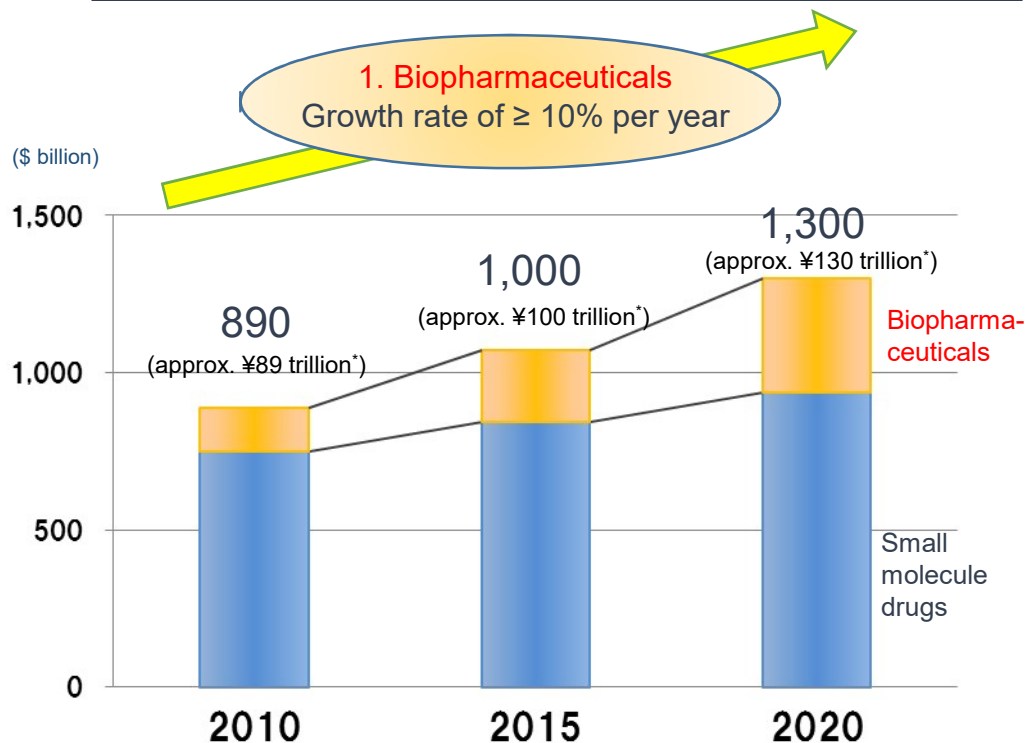


Market Size of the Pharmaceutical Field that Ajinomoto Co. is Focused on

(1. **Biopharmaceuticals** 2. **Regenerative medicine**)

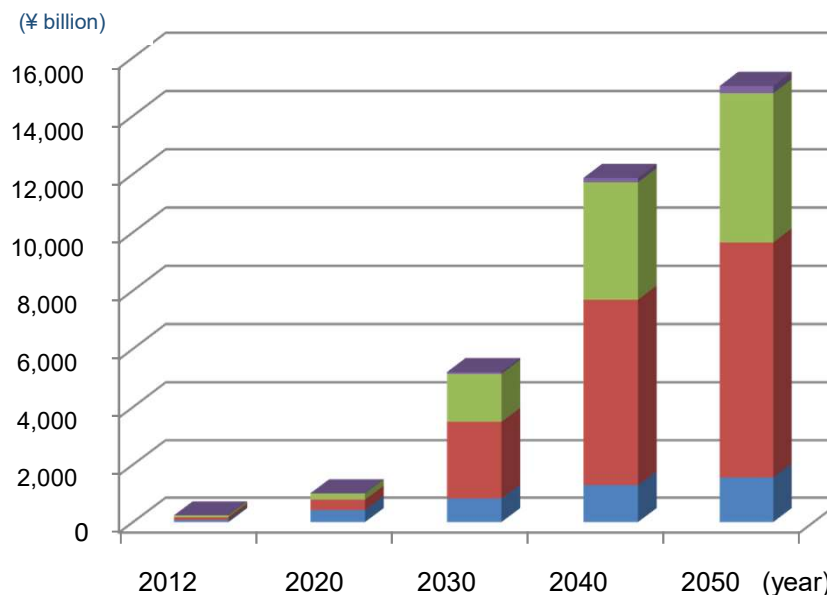
1. The entire **biopharmaceutical** and pharmaceutical market

2. **Regenerative medicine**-related market



(Ajinomoto Co. estimation)

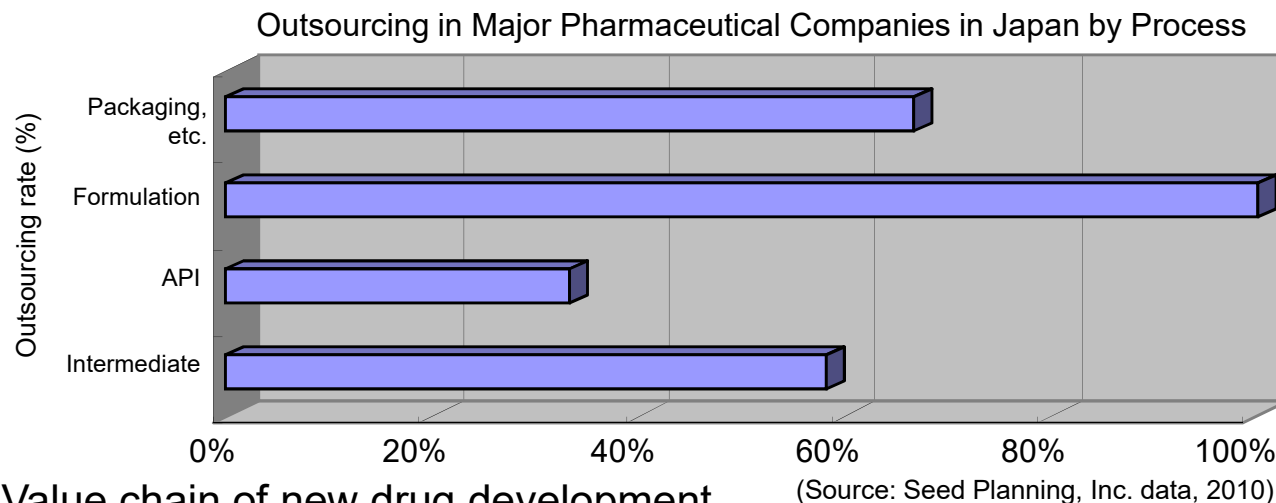
Calculated at \$1 = ¥100



- Drug development market
- Cell and tissue manufacturing market
- **Materials (cell culture medium, reagents, devices, etc.) market**
- Equipment market

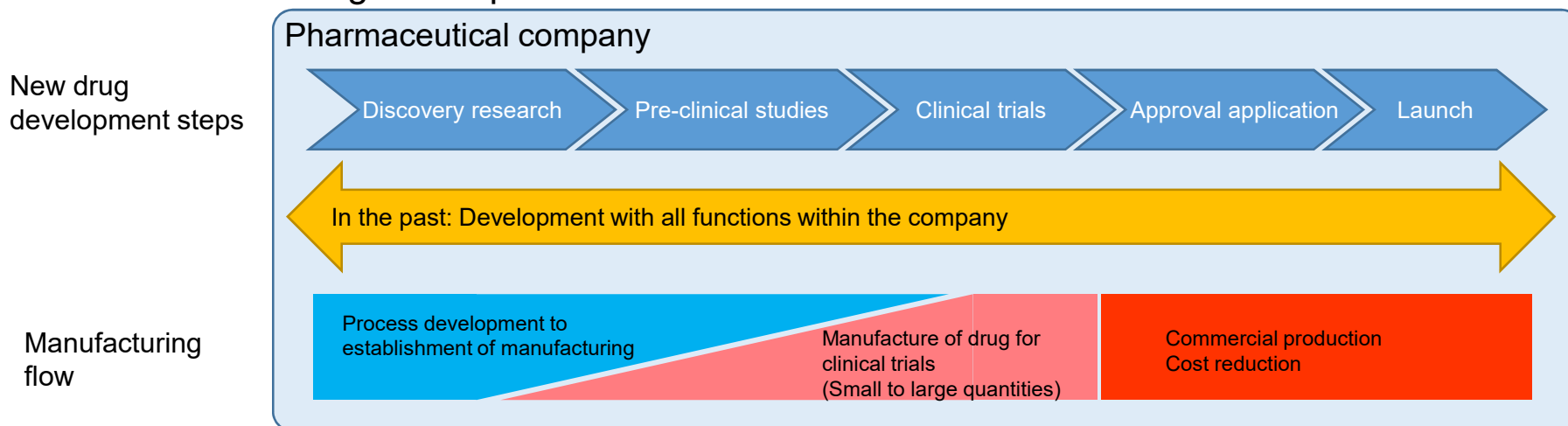
(Source: Seed Planning, Inc. data)

Changes in Pharmaceutical Industry Business Structure

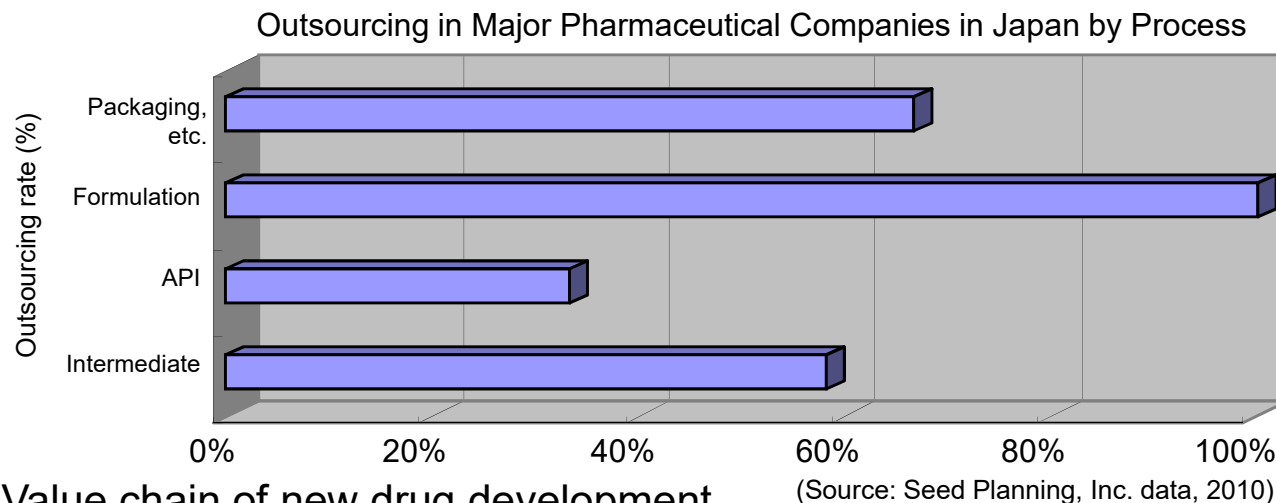


With increased sophistication in development and manufacturing technology of intermediates, API and formulation, etc., the pharmaceutical industry is moving towards specialization in these areas.

Value chain of new drug development

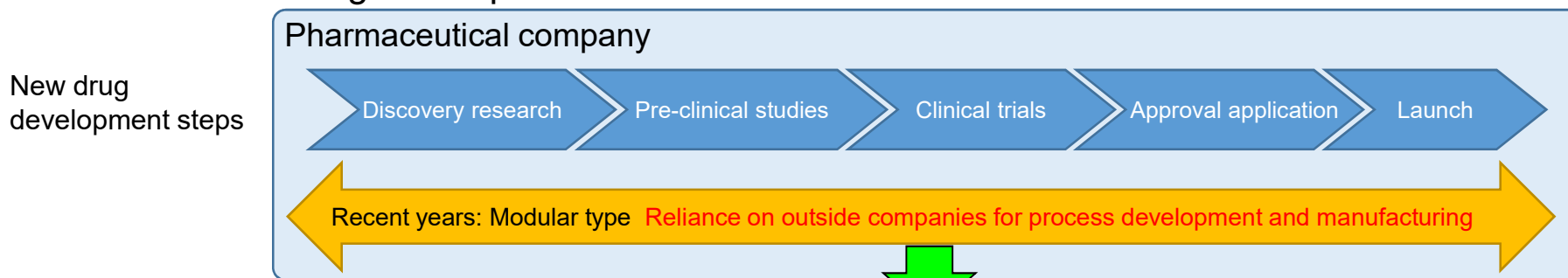


Changes in Pharmaceutical Industry Business Structure

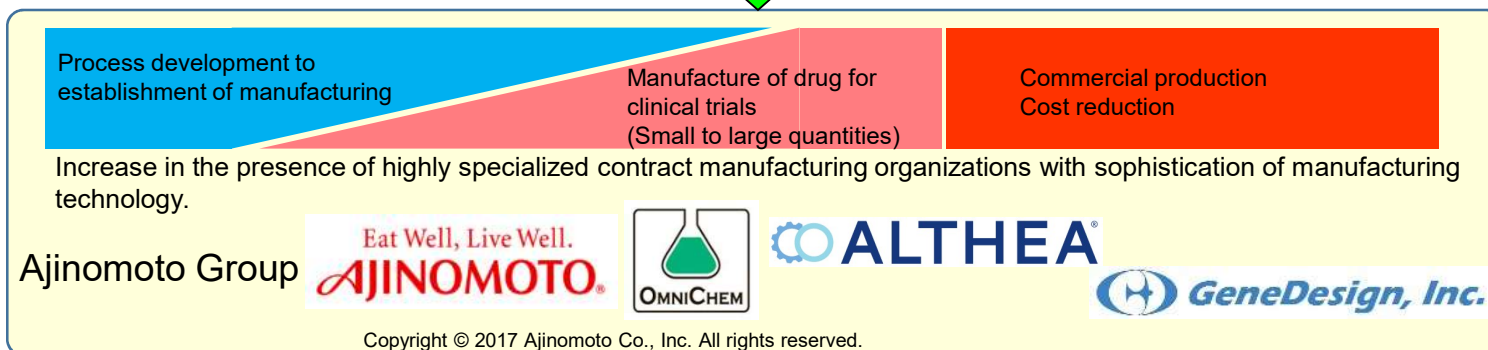


With increased sophistication in development and manufacturing technology of intermediates, API and formulation, etc., the pharmaceutical industry is moving towards specialization in these areas.

Value chain of new drug development



Manufacturing flow



Activities in Each Business Field

Business category	Initiative	Organization	FY17	FY18	FY19
1. Biopharmaceuticals Antibodies, recombinant proteins, ADCs Oligonucleotides	Enter ADC contract manufacturing business	Ajinomoto Althea, Inc.	Prior investment		Profit contribution
	Strengthen Fill & Finish business		Steady growth (revenue base)		
	Enhance pipeline	GeneDesign, Inc. Ajinomoto Co., Inc.	Make GeneDesign, Inc. a consolidated subsidiary		
	Establish production framework		Establish production framework Aim for global No. 2		
2. Regenerative Medicine	Global rollout of cell culture medium for regenerative medicine	Ajinomoto Co., Inc.	Roll out to Europe, in addition to N. America & S. Korea	Accelerate overseas rollout (make contribute to profits)	
	Cell cultures for regenerative medicine		Expand varieties for growth and differentiation		
	Cell culture ingredients (scaffold proteins, growth factors, etc.)		Continue R&D Launch new products in stages from FY17		

Activities in Each Business Field

Business category	Initiative	Organization	FY17	FY18	FY19
1. Biopharmaceuticals Antibodies, recombinant proteins, ADCs Oligonucleotides	Enter ADC contract manufacturing business	Ajinomoto Althea, Inc.	Prior investment		Profit contribution
	Strengthen Fill & Finish business		Steady growth (revenue base)		
	Enhance pipeline	GeneDesign, Inc. Ajinomoto Co., Inc.	Make GeneDesign, Inc. a consolidated subsidiary		
	Establish production framework		Establish production framework Aim for global No. 2		
2. Regenerative Medicine	Global rollout of cell culture medium for regenerative medicine	Ajinomoto Co., Inc.	Roll out to Europe, in addition to N. America & S. Korea	Accelerate overseas rollout (make contribute to profits)	
	Cell cultures for regenerative medicine		Expand varieties for growth and differentiation		
	Cell culture ingredients (scaffold proteins, growth factors, etc.)		Continue R&D Launch new products in stages from FY17		

Ajinomoto Althea, Inc. which Handles the **Biopharmaceutical** Contract Business

Althea Technologies Inc. (Currently Ajinomoto Althea, Inc.) acquired
in April 2013

Acquisition price (approx. ¥16 billion)

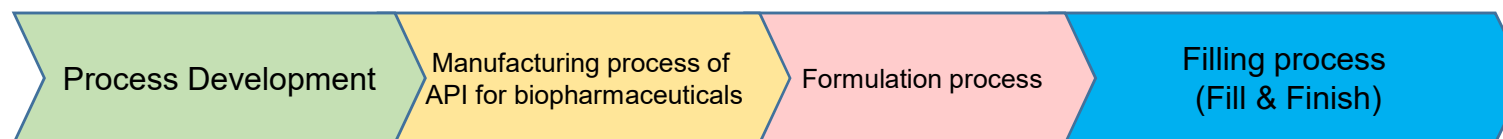
 **ALTHEA**



San Diego

Main businesses

- Contract aseptic filling and packaging of biopharmaceuticals (Fill & Finish)
- Contract manufacturing and process development of biopharmaceuticals



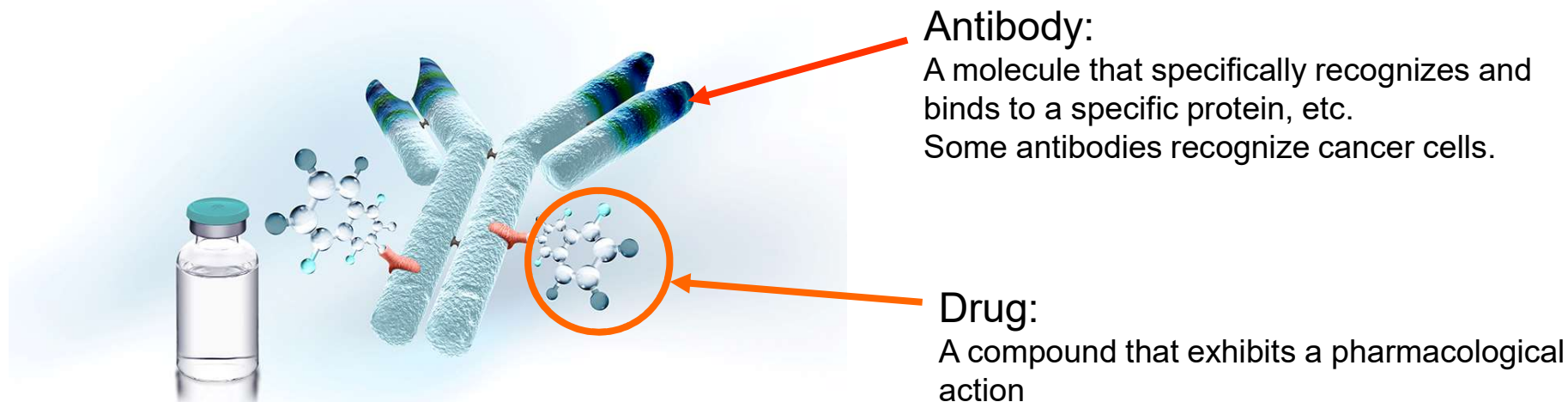
Covers the value chain in biopharmaceutical manufacturing

Future business focus

- Contract manufacturing of ADCs (antibody-drug conjugates)

Enter ADC Contract Manufacturing Business: What is “ADC”?

ADC: Antibody Drug Conjugate

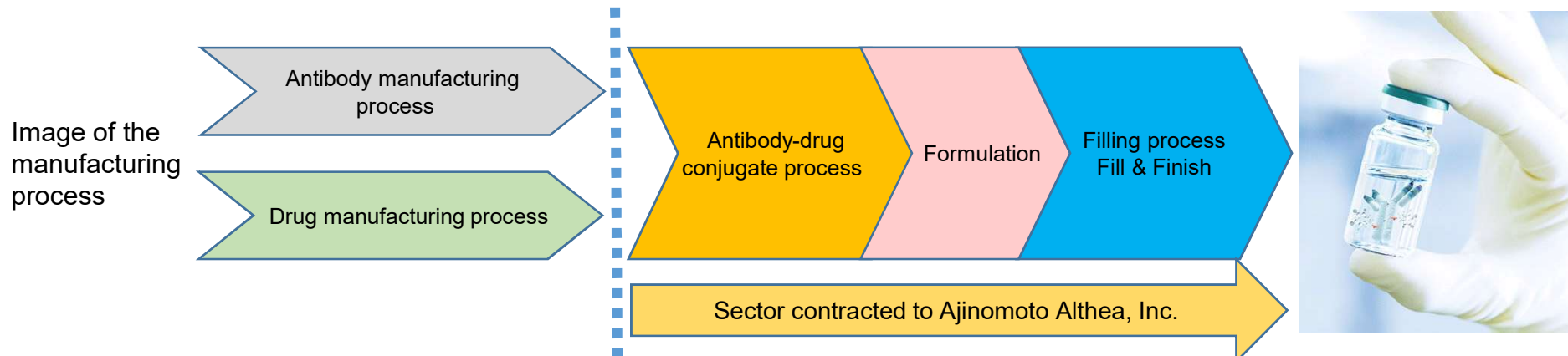


	Advantages	Disadvantages
Antibody drug	Exerts its effect when it reaches the target (cells) ⇒ Relatively minor side effects	High manufacturing cost
Drug (small molecule drug)	Low cost compared to antibody drugs Strong pharmacological action	Low selectivity towards target, exerts effect on normal cells ⇒ Serious side effects

An ADC is a drug that aims to utilize the high target selectivity of antibodies to deliver a pharmacological agent to target cells where it exerts its effect.

⇒ There are expectations for them to be “the next generation of antibody drugs,” capable of increasing the striking power towards target cells while reducing side effects. They are the focus of development in major pharmaceutical companies at home and abroad.

Enter ADC Contract Manufacturing Business



Provision of contract manufacturing and services began with **the only base in the United States which was able to provide one-stop service** from antibody drug conjugation to formulation and on to fill & finish

Introduction of process development and analysis laboratory equipment completed

- ⇒ Services commenced in January 2016
- Support the early development stage of ADCs in pharmaceutical companies

Expected to contribute to profits in FY2019

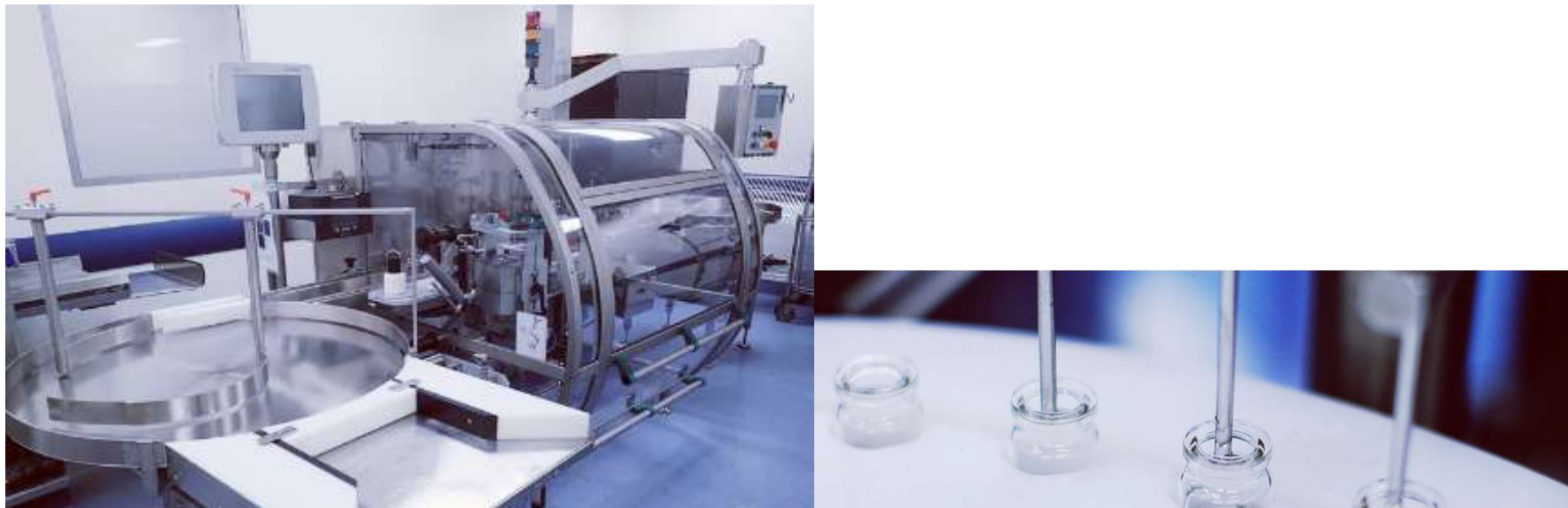


Strengthening of the Fill & Finish Business in Ajinomoto Althea, Inc.

What is Fill & Finish?

Process at the final stage of biopharmaceutical manufacture in which the product is filled **aseptically** into vials and syringes to become the final product.

Flexible facilities allowing production of a wide variety of products and switchover production. Facilities comply with the pharmaceutical regulations in various countries responding quickly to the needs of pharmaceutical companies.



With Fill & Finish as its revenue base, Ajinomoto Althea, Inc. aims for steady growth and development

Activities in Each Business Field

Business category	Initiative	Organization	FY17	FY18	FY19
1. Biopharmaceuticals Antibodies, recombinant proteins, ADCs Oligonucleotides	Enter ADC contract manufacturing business	Ajinomoto Althea, Inc.	Prior investment		Profit contribution
	Strengthen Fill & Finish business		Steady growth (revenue base)		
	Enhance pipeline	GeneDesign, Inc. Ajinomoto Co., Inc.	Make GeneDesign, Inc. a consolidated subsidiary		
	Establish production framework		Establish production framework Aim for global No. 2		
2. Regenerative Medicine	Global rollout of cell culture medium for regenerative medicine	Ajinomoto Co., Inc.	Roll out to Europe, in addition to N. America & S. Korea	Accelerate overseas rollout (make contribute to profits)	
	Cell cultures for regenerative medicine		Expand varieties for growth and differentiation		
	Cell culture ingredients (scaffold proteins, growth factors, etc.)		Continue R&D Launch new products in stages from FY17		

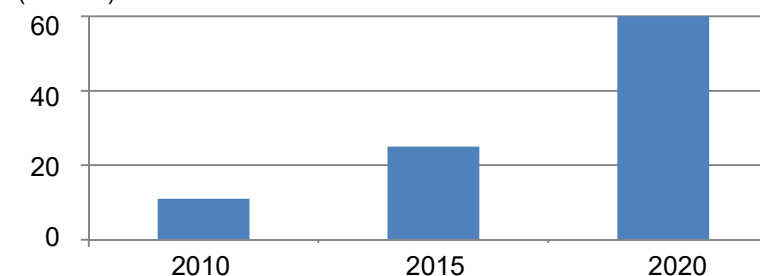
What are Oligonucleotides?

	Main Target Diseases	Characteristics	Structure	Our Strengths
Oligonucleotides	Applicable to a wide range of diseases including cancer, cardiovascular diseases, infectious diseases, and autoimmune diseases (rheumatism, etc.) and rare diseases such as muscular dystrophy	Their targets and mechanisms of action are clear and highly specific	A chain of several to over a hundred nucleic acids	A field in which we can fully utilize our wealth of technology and know-how relating to nucleic acids, which are the raw materials. We developed a unique manufacturing technology AJIPHASE®

The number of products in development entering clinical trials has increased substantially over recent years, and the market will grow rapidly

⇒ Increased opportunities for contract manufacturing

Size of Contract Manufacturing Market (¥ billion)



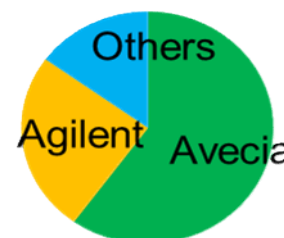
(Source: Seed Planning, Inc., data)

Competitive Technology

Solid Phase Synthesis
100%



- ◆ All oligonucleotides are manufactured by a solid phase synthesis (other than **AJIPHASE®**)
- ◆ The increase of needs for technology capable of mass production

Competitors



- ◆ Oligopoly of two companies, Avecia and Agilent

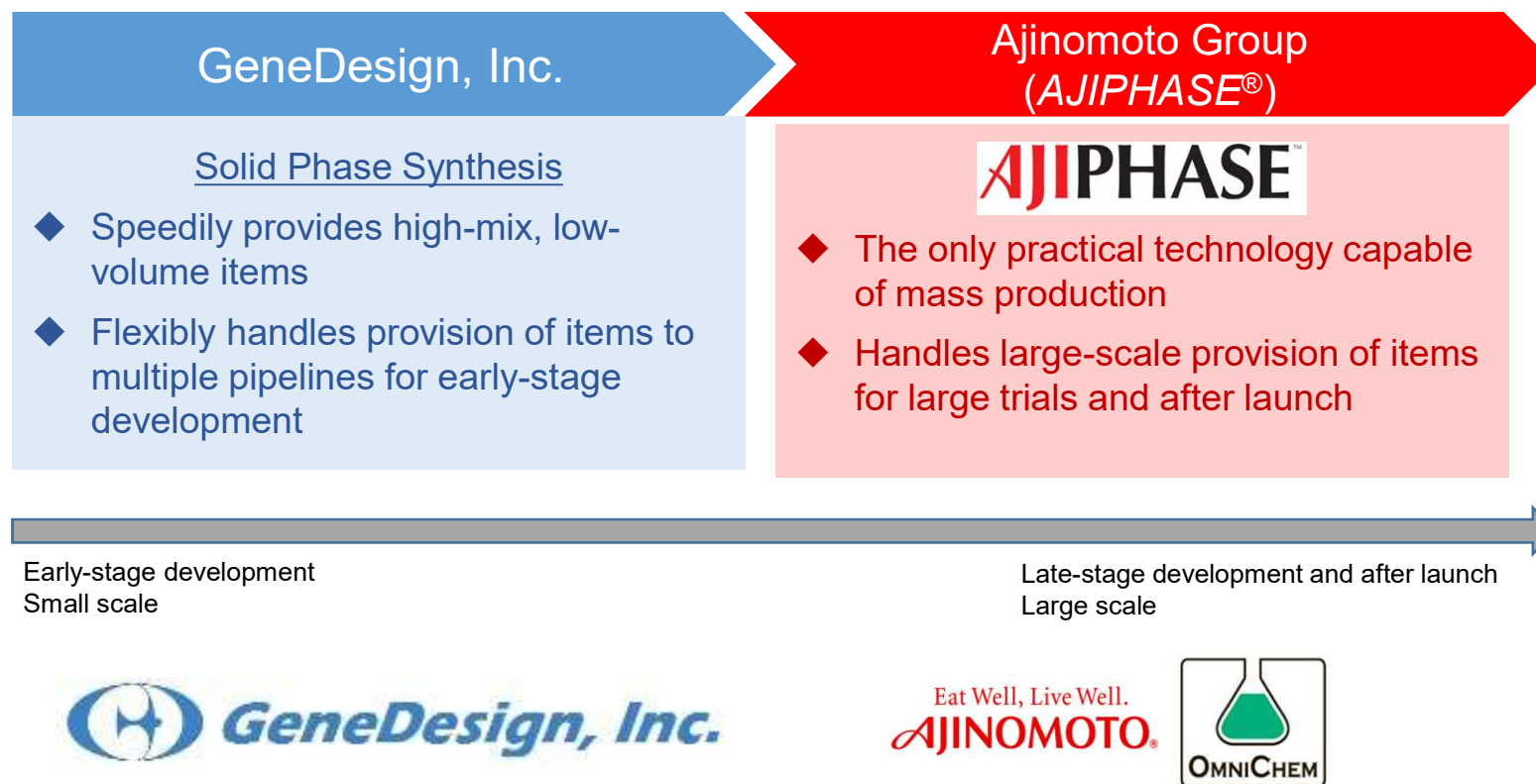
What is *AJIPHASE*[®] Technology?

	Solid phase synthesis	AJIPHASE [™]
Manufacturing equipment	Dedicated oligonucleotide equipment required 	General chemical synthesis equipment can be used 
Manufacturing scale	Several kg/lot	Several hundred kg/lot
Development period	Quick	Longer than solid phase synthesis

Establish **AJIPHASE**[™] technology as the **only practical manufacturing method capable of mass production** with new drug candidates anticipated future demand of several hundreds kg to several tons.

Strengthening of the Oligonucleotide Business

All shares in GeneDesign, Inc. were acquired in December 2016



Establish the system that makes possible a contract development and manufacturing business for oligonucleotides from early-stage development to late-stage development and after launch.

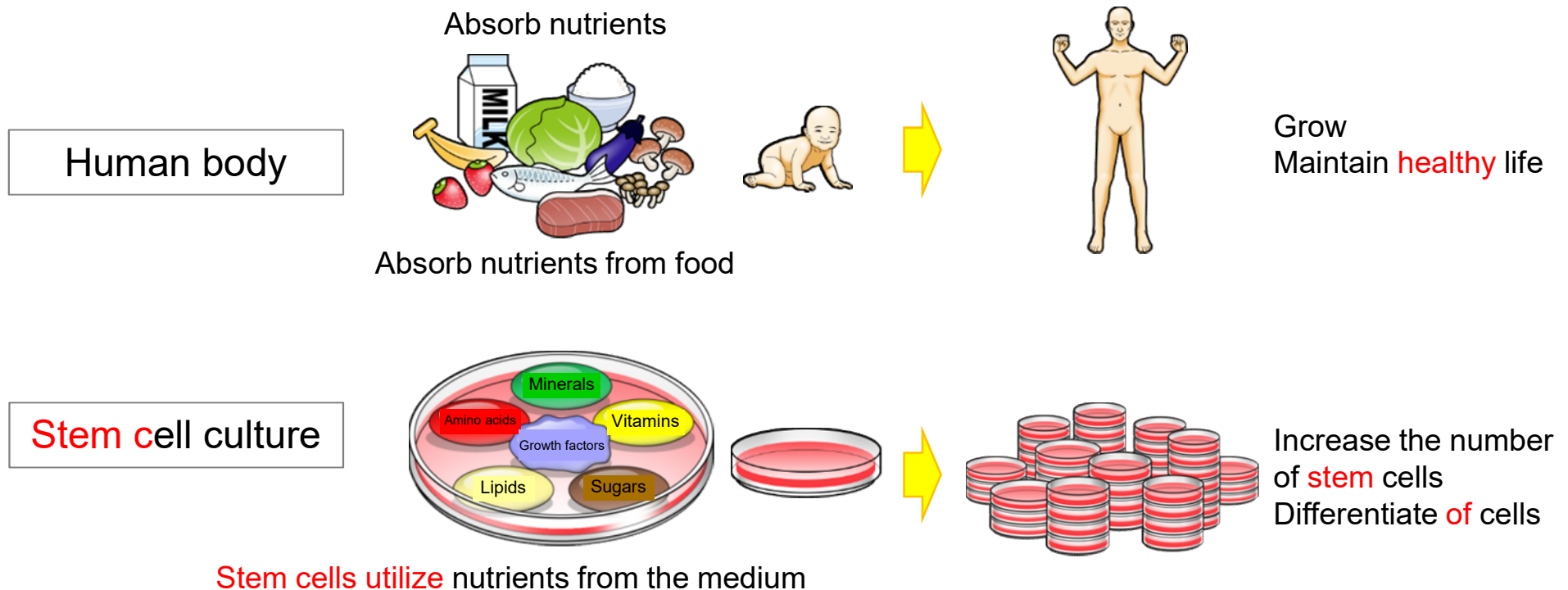
⇒ Aim global No. 2 through establishing the production framework

Activities in Each Business Field

Business category	Initiative	Organization	FY17	FY18	FY19
1. Biopharmaceuticals Antibodies, recombinant proteins, ADCs Oligonucleotides	Enter ADC contract manufacturing business	Ajinomoto Althea, Inc.	Prior investment		Profit contribution
	Strengthen Fill & Finish business		Steady growth (earnings foundation)		
	Enhance pipeline	GeneDesign, Inc. Ajinomoto Co., Inc.	Make GeneDesign, Inc. a consolidated subsidiary		
	Establish production framework		Establish production framework Aim for global No. 2		
2. Regenerative Medicine	Global rollout of cell culture medium for regenerative medicine	Ajinomoto Co., Inc.	Roll out to Europe, in addition to N. America & S. Korea	Accelerate overseas rollout (make contribute to profits)	
	Cell cultures for regenerative medicine		Expand varieties for growth and differentiation		
	Cell culture ingredients (scaffold proteins, growth factors, etc.)		Continue R&D Launch new products in stages from FY17		

Regenerative Medicine What is a **Stem** Cell Culture Medium?

A **stem** cell culture medium contains a well-balanced mix of amino acids, sugars, lipids, vitamins, minerals and growth factors* necessary for stem cells.



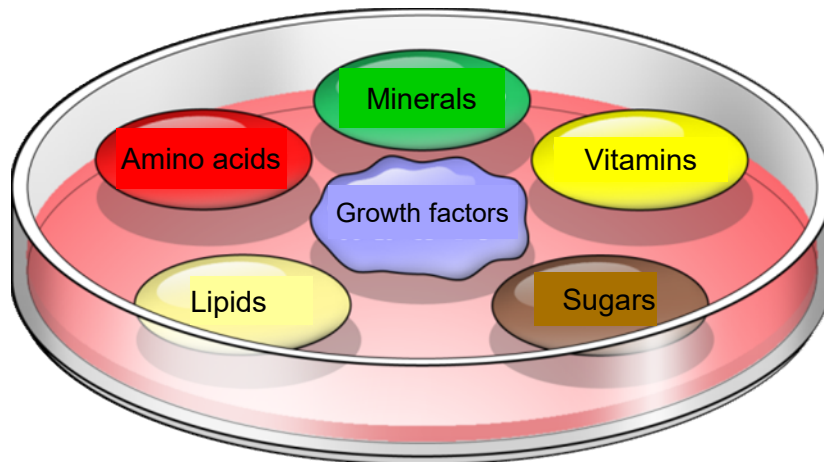
iPS cells **utilize** the necessary nutrients from the medium, proliferate, and transform into tissue for transplantation

*Growth factors: "Signaling" proteins that are abundantly present in our body and which are necessary for proliferation of stem cells, such as iPS cells, and for the transformation of these into **tissue or** other types of cells.

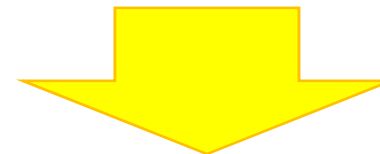
Requirements for **Stem** Cell Culture Medium Used in **Regenerative Medicine**

Issues for development of **stem** cell culture medium for regenerative medicine

1. **Performance** → There are no high-performance culture media that can be used in regenerative medicine!
2. **Safety** → The majority of existing **medium** use components extracted from animals or human (high risk)
3. **Cost** → Existing **medium** are too expensive to use in the **current process**

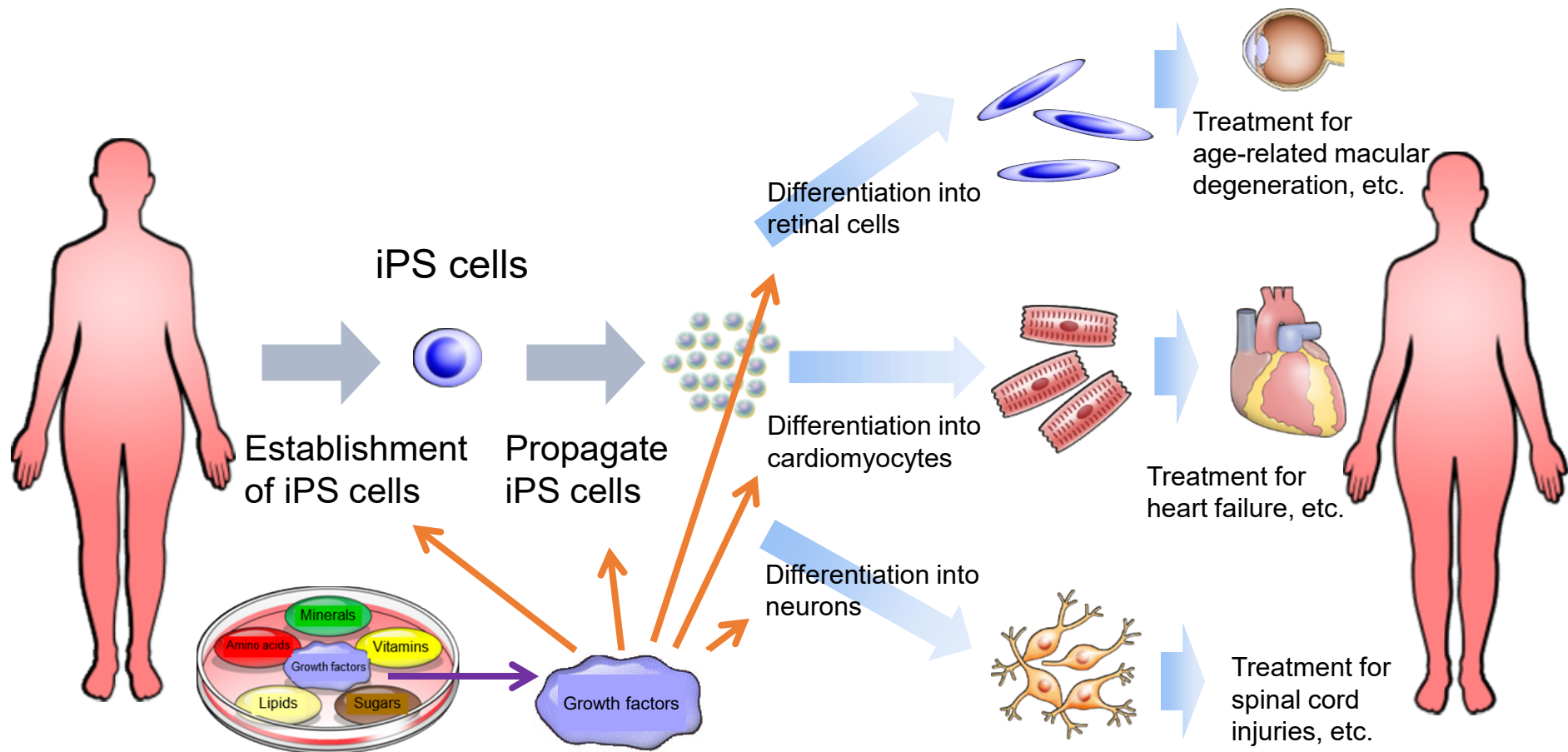


Ajinomoto Co. can supply and use highly purified amino acid, growth factors to make the most superior medium for the clinical studies.



By the determination of the **nutrient consumption** and the application research of the **growth factors**, Ajinomoto developed very novel stem cell culture for iPS and ES cell. This medium will promote the human study of iPS and ES cells.

Image of the Application of iPS Cells for Regenerative Medicine



The key is to provide the various growth factors intimately involved in propagation and differentiation.

Turning growth factors into products using biotechnology ⇒

Develop products of **stem** cell culture media for various differentiations

Provision of growth factors themselves

Development of **Stem** Cell Culture Medium for **Regenerative Medicine**

Ajinomoto Co., Inc.

- Research on amino acid nutrition and metabolism
- Analysis technology
Amino acid analysis technology: *Amino Index*[®]
- **Formulating** technology, nutrient development and manufacturing technology
Enteral nutrition formula *ELENTAL*[®], serum-free cell culture media
- **Biotechnology**
Growth factor (protein) production technology *CORYNEX*[®]

Center for iPS Cell Research and Application, Kyoto University (CiRA)

- **Novel** research relating to iPS cells
Technological development relating to iPS cell establishment, propagation, undifferentiated potency preservation, storage and cell differentiation, etc., evaluation techniques and analytical research of mechanisms

Eat Well, Live Well.
AJINOMOTO

Fusion of technological capabilities



Swift discovery of optimal composition



Succeeded in producing the high performance cell culture medium **StemFit**[®]

SCIENTIFIC
REPORTS

Results announced in the Scientific Reports
(Nakagawa et al., 2014)

Global Expansion of *StemFit*® Cell Culture Medium for Regenerative Medicine

Products for the Japanese market



For clinical research

StemFit® AK03N

- Confirmed by the PMDA* for clinical research purposes
- Direct sales commenced in December 2015 by Ajinomoto Healthy Supply Co., Inc.

*PMDA: Pharmaceuticals and Medical Devices Agency



For basic research

StemFit® AK02N

- **Product** for use in basic research **launched** in October 2015 by Takara Bio Inc. and ReproCELL Inc.

Global product



StemFit® Basic02

- Sales in the US commenced in September 2016
- Sales in South Korea commenced in March 2017
- Plan to commence sales in Europe in FY2017

Realization of ASV(Ajinomoto Shared Value) through Healthcare

"Genuine Global Specialty Company"
To become a global top 10 class company that grows sustainably through ASV

Integrated Value

Corporate Brand

Enhance brand value through creating social/economic value, which leads to further value creation
FY20 brand value target¹⁾ = 1,500 mil.USD or more

FY20 Integrated Targets

Financial targets in IFRS (economic value)		Non-financial targets ²⁾ (social value)	
Business profit	¥137.0 bil. or more	Meats and vegetables consumption ³⁾ (Japan, Five Stars) ⁴⁾	S Meats: 8.6 mil. tons/yr; 19% (9.7kg/person/yr) vs FY15 +3% (+2.0kg) E Vegetables: 5.5 mil. tons/yr; 8% (6.2 kg/person/yr) vs FY15 +2% (+1.6kg)
Business profit margin	10%	Contribution to eating together (Japan, Five Stars) ⁴⁾	S 70 times / households / year vs FY15 +20 times
ROE	10% or higher	Spare time created (Japan) ⁵⁾	S 38 mil. hrs / yr (6 hrs / yr / households) vs FY15 +7 mil. hrs
EPS growth rate	Double-digit annual growth	Contribution to comfortable lifestyles (AminoScience)	S 22 mil. people vs FY15 +4 mil. people
Intl. sales growth rate (consumer foods) (local currency basis)	Double-digit annual growth	Resolution of environmental issues	E Contribution to the global environment through initiatives ahead of std. intl. targets e.g. GHG ⁶⁾ : 50% reduction by FY30 ⁷⁾
		Employees with high engagement	G 80%

S: Social E: Environmental
G: Governance

1. Measured by Interbrand; 2. Refer to Reference Materials (p.36-40) for definitions of non-financial targets and calculation assumptions; 3. Annual total and % of annual consumption per person;
4. Calculation based on certain products in Japan and Five Stars; 5. Calculated using certain Japan Frozen Foods and Soup products.; 6. GHG = Greenhouse gases; 7. Compared to FY07
Note: std. = standard, intl. = international

Eat Well, Live Well.

AJINOMOTO®