# Life Science Business

AGC Inc.

June 25, 2019

Your Dreams, Our Challenge

# Content of today's presentation

AGC
Your Dreams, Our Challenge

1. Life science business of AGC
   - positioned as one of the *strategic business* of AGC

2. Macro business environment

3. CDMO business of AGC

4. Requirements for CDMOs and AGC's efforts

# 1.Life science business of AGC

- **positioned as one of the *strategic business* of AGC**

# AGC Group's long-term strategy

AGC
Your Dreams, Our Challenge

## "Vision 2025"

**The AGC Group's Core Businesses will serve as solid sources of earnings, and Strategic Businesses will become growth drivers and lead further earnings growth.**
**The AGC Group will continue being a highly profitable, leading global material and solution provider.**

### Core businesses

**Establishing long-term, stable sources of earnings through the portfolio management**

- Architectural glass
- Automotive glass (existing)
- Essential chemicals
- Performance chemicals
- Display glass
- Ceramics

### Strategic businesses

**Establishing highly profitable businesses through expansion of high value-added businesses**

- Mobility
- Electronics
- Life science

# Strategic Businesses
# Highly profitable businesses with growth potential

AGC Your Dreams, Our Challenge

## 【Changes in the macroscopic environment】

**Arrival of IoT era**
**Evolution of transportation infrastructure**
**Building new eco-system**

**Longer life expectancy**
**Increase of global population**
**Greater safety, security, comfort**





| Mobility | Electronics | Life Science |
|---|---|---|
| Connected cars/ Automated driving, Evolution of information display, Lighter-weight transportation means | Arrival of IoT/AI era, Next-generation high-speed communications/ Automated driving, Use of novel devices | Safe & secure medical care, Longer life expectancy, Increase of global population |

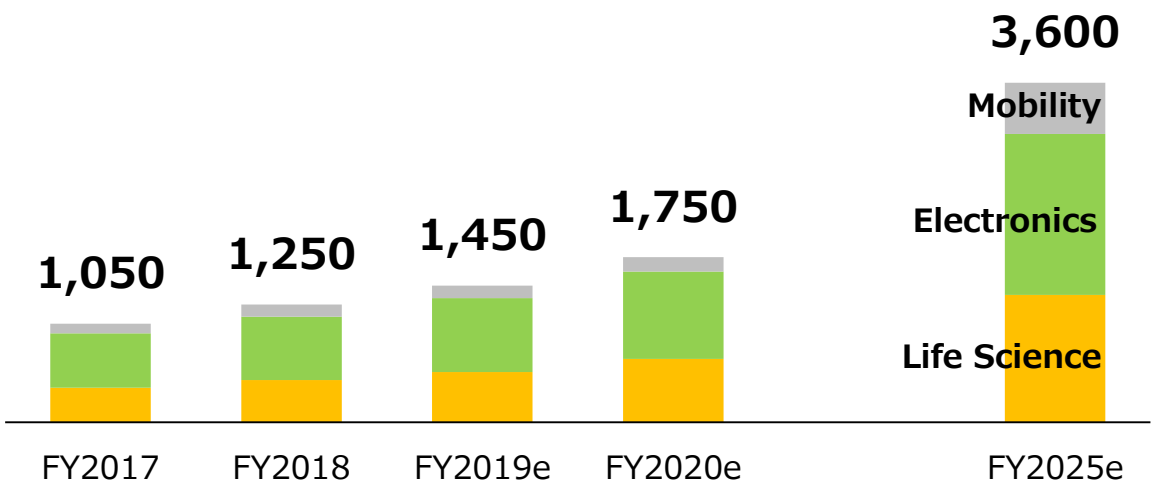
**Strategic Businesses**

# Future Growth by Strategic Businesses category

- **Electronics and Life science will start generating profit first.**
- **Mobility will gradually produce results after FY2021.**

**Sales (Strategic business)**

(100 m yen)




| | | | | | | |
|---|---|---|---|---|---|---|
| OP (Strategic business) | 120 | 210 | 280 | 400 | | 900 |
| Contribution ratio | 10% | 17% | 22% | 25% | | 40% |

(100 m yen)

**Major products & business**

**Mobility**

- Cover glass for car-mounted displays
- New materials for mobility, including 5G communications.

**Electronics**

- Semiconductor-related products
- Optoelectronics materials
- Next-generation high-speed communication related products
- Fluorinated products for electronics

**Life Science**

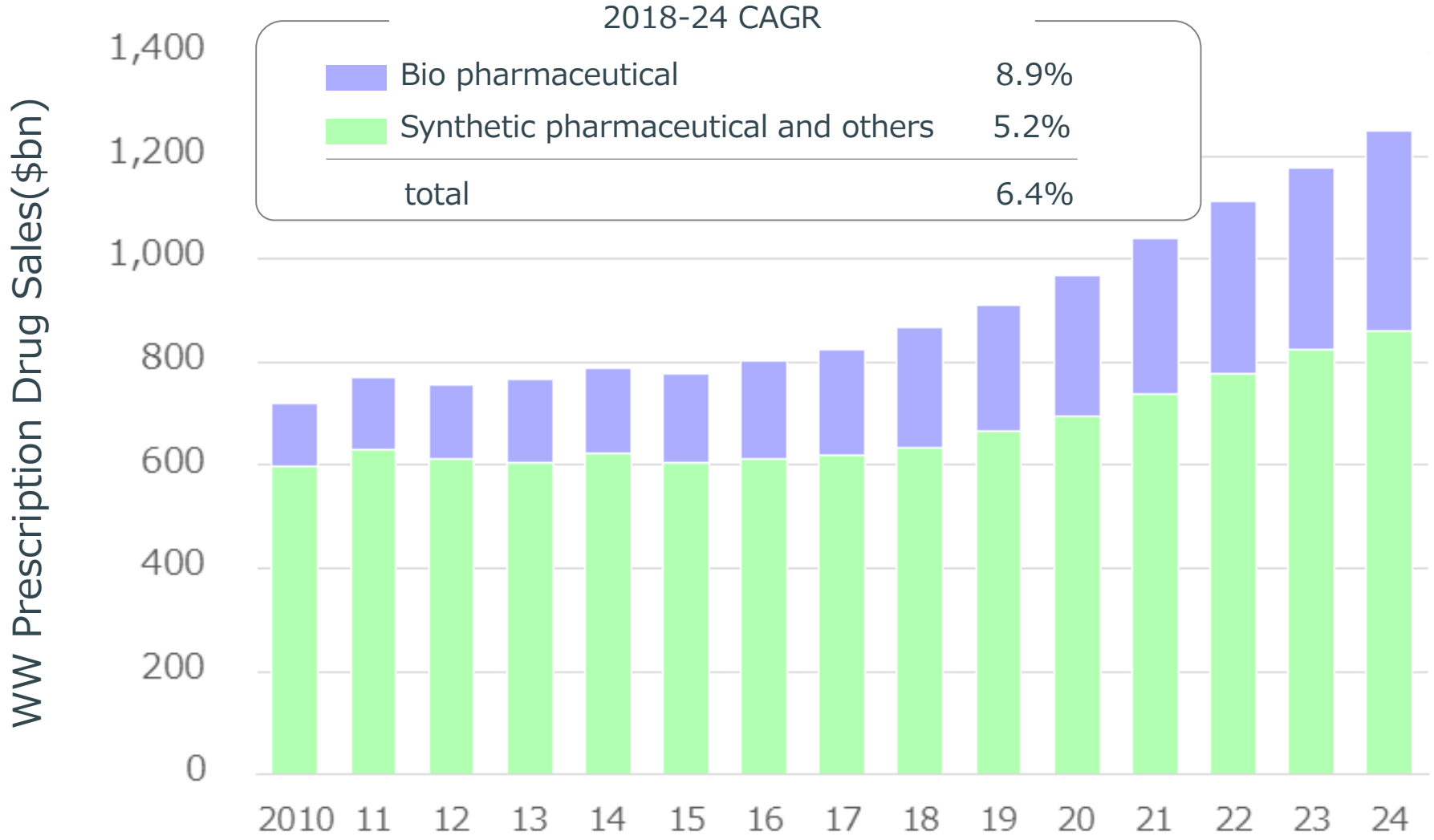
- Synthetic pharmaceutical and agrochemical
- Bio CDMO

# 2.Macro business environment

# Worldwide Prescription Drug Sales Forecast

AGC
Your Dreams, Our Challenge

## ➢ Worldwide Total Prescription Drug Sales (2010-2024)




Source : Chart made by AGC based on data from EvaluatePharma® World Preview 2018, Outlook to 2024

# AGC's business area in the flow of new drug development

AGC
Your Dreams, Our Challenge

- Our business area covers up to the contract development/manufacture of the "active pharmaceutical ingredient (API)" of a drug used in the "clinical study" and subsequent stages.

| Basic research/ preclinical | Clinical studies | | | Application for approval | Manufacturing/Marketing | |
|---|---|---|---|---|---|---|
| | Phase I | Phase II | Phase III | | Patent term of new drug | Advent of generics / biosimilars |
| 5-10 years | 3-7 years | | | 1-2 years | ~10 years | - |
| Discovery and screening of new candidate substances for drugs, evaluation of the properties and safety of such substances in animals | These studies are also referred to as "clinical trials" and performed in human subjects, usually following the above 3 steps | | | Approval is granted by the Minister of Health, Labour and Welfare after confirmation of the efficacy/safety of the drug | The product is manufactured and marketed as a new drug. After expiration of the patent term, generics (biosimilars) will be allowed to enter the market. | |

Provision of services related to API manufacturing

AGC Biologics (Denmark)

AGC Biologics (Chiba Bio Plant)

AGC's CDMO business

**Synthetic pharmaceuticals**

Raw materials → Inter-mediate** → API* → Drug product

AGC's business area

**Biopharma-ceuticals**

Genetic transformation → API manufacturing (Cultivation → Isolation → Purification) → Drug product

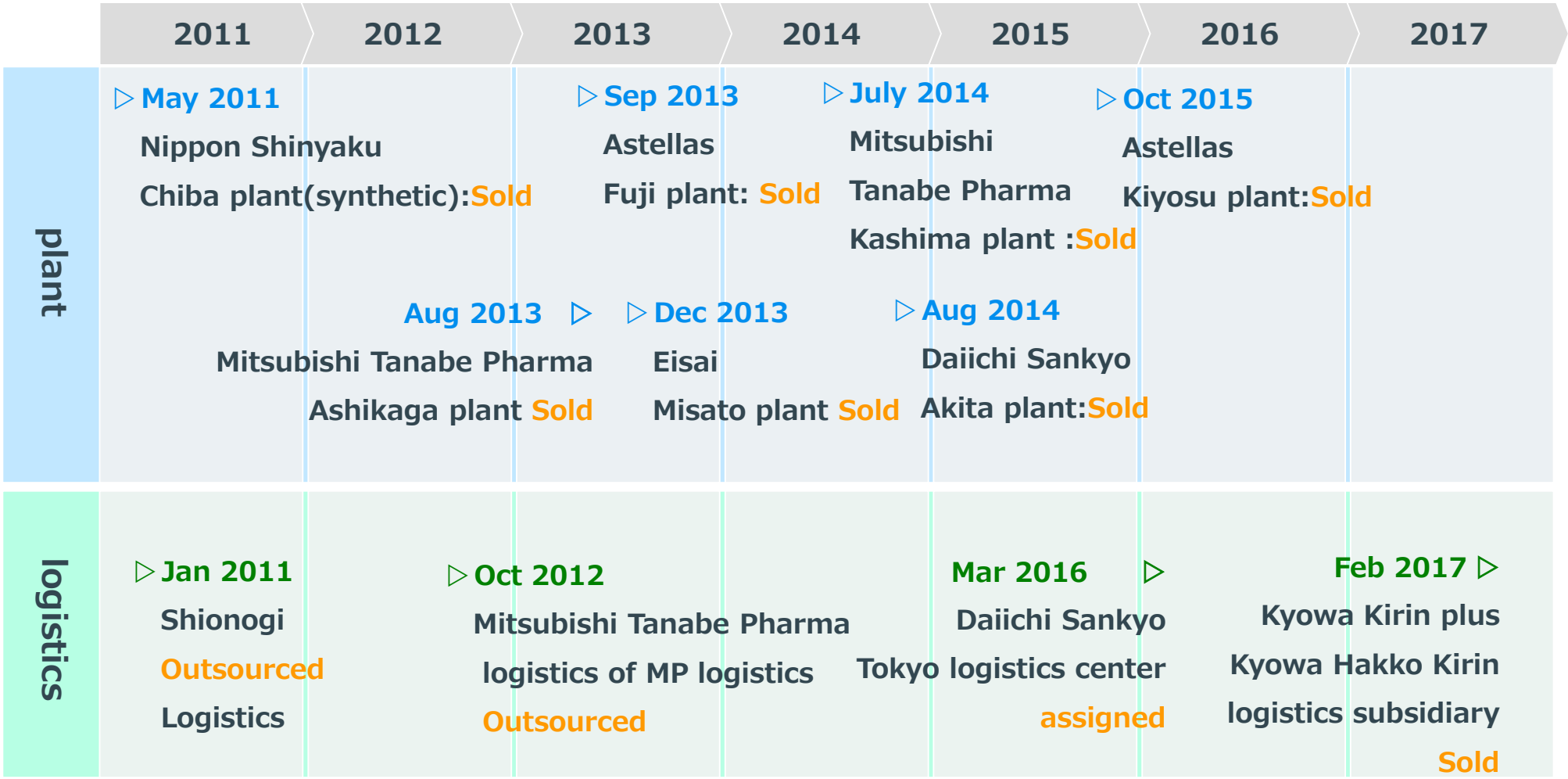
AGC's business area

* API (the active ingredient of a drug), ** Intermediate (a product that requires one more reaction step before it becomes a drug substance)

# Trend of the pharmaceutical companies

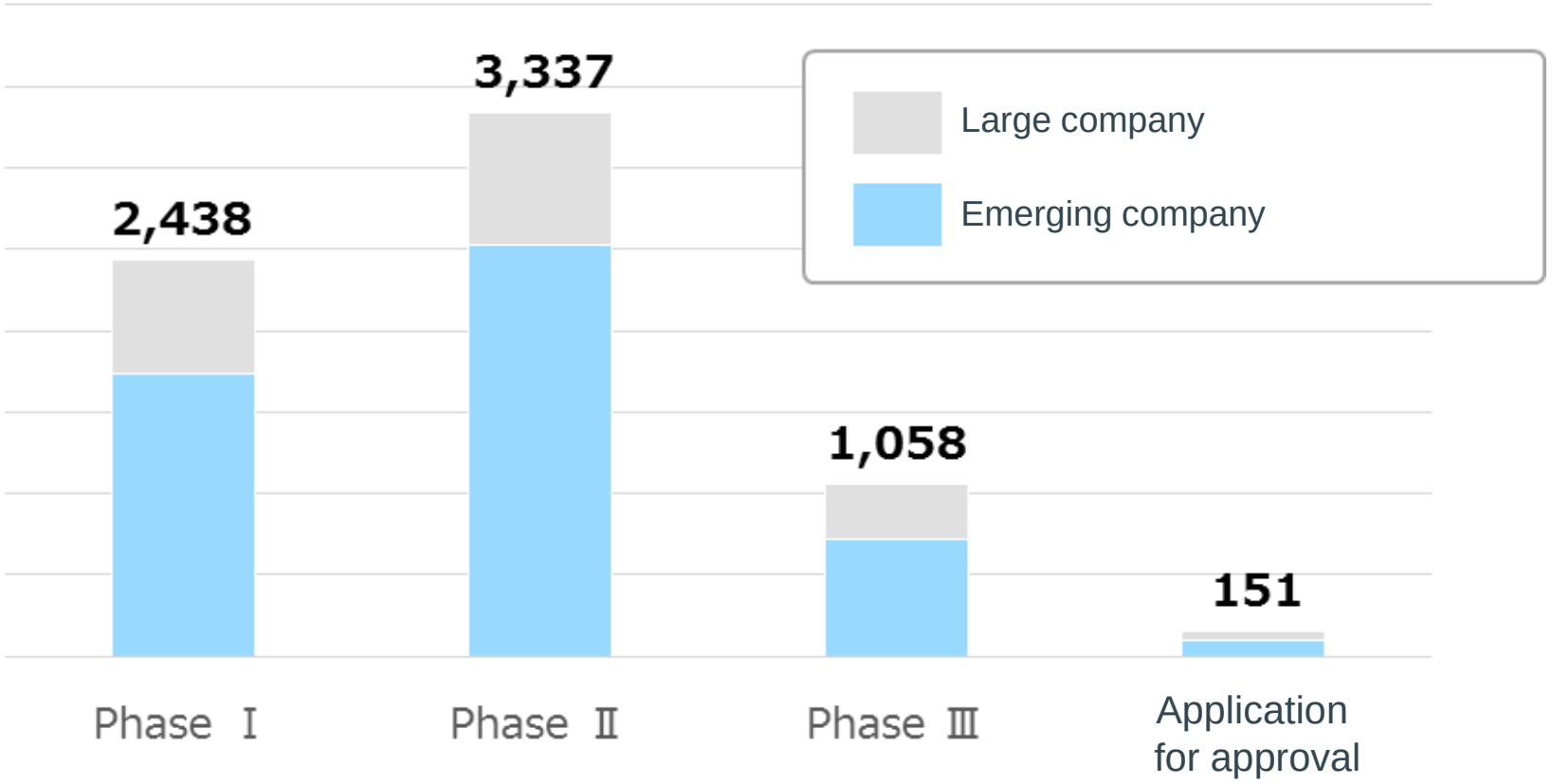
AGC
Your Dreams, Our Challenge

- Global trend is to sell manufacturing plants, including Japan. Current trend is also to outsource or sell in-house functions, such as logistics.



# A large portion of the global clinical pipelines are held by emerging companies

Number of global clinical pipelines (database accessed in April 2019)



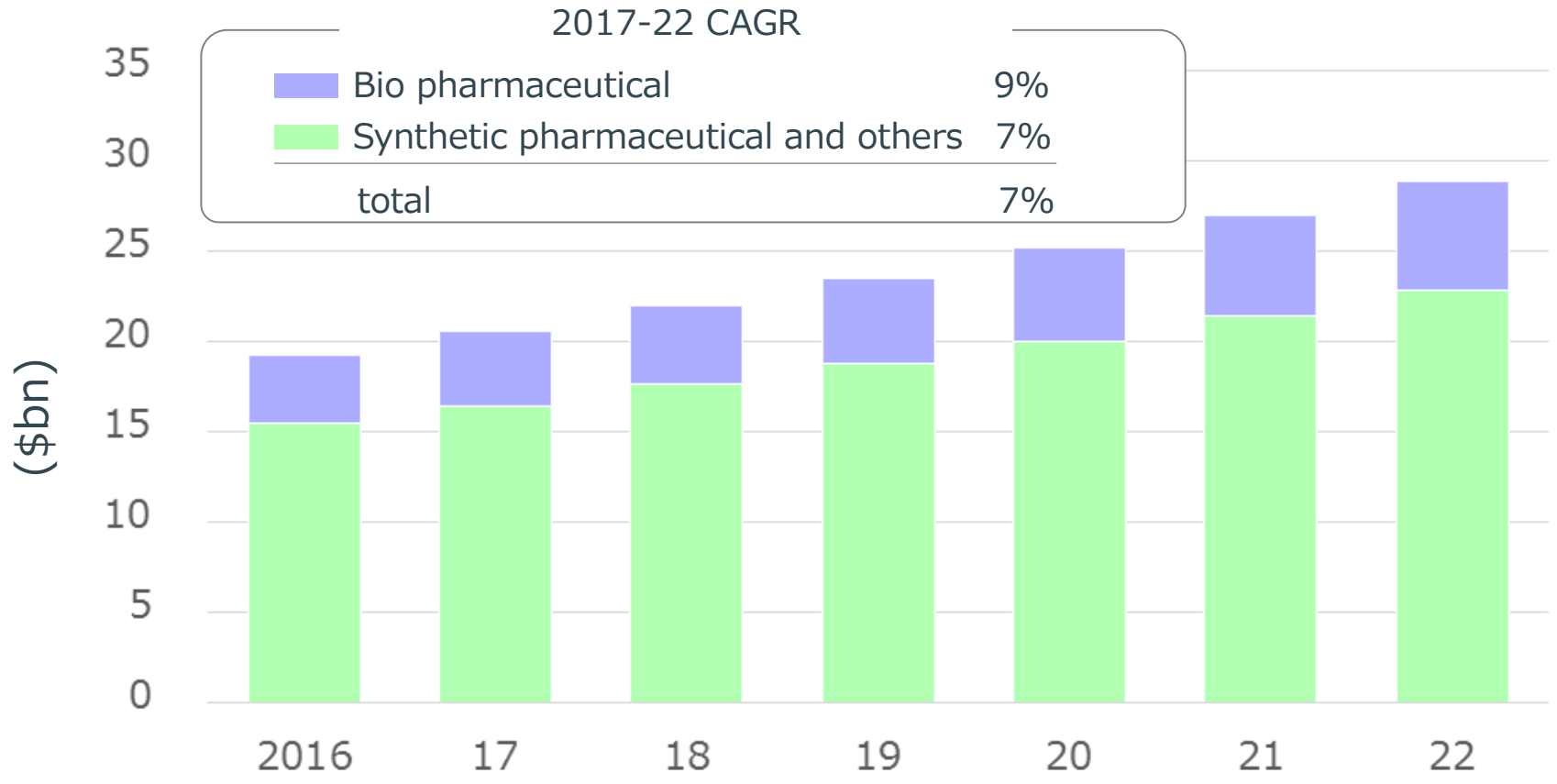

Based on analysis of the BioMedTracker database accessed April 2019.

Source: The chart made by AGC based on data from 2019 Emerging Therapeutic Company Trend Report

# Worldwide pharmaceutical CDMO market

- Worldwide pharmaceutical CDMO market was $20.5bn in 2017 and is expected to grow at a CAGR of +7% to $28.8bn in 2022.
- Steady growth is expected for Synthetic pharmaceutical (CAGR 7%) and biopharmaceuticals (9%)

Worldwide pharmaceutical CDMO market (AGC estimate)




Source: The chart made and estimated by AGC based on data from EvaluatePharma® World Preview 2017, Outlook to 2022

# 3.CDMO business of AGC

## （Contract Development Manufacturing Organization）

# Overview of CDMO services/co-development business for synthetic pharmaceuticals /agrochemicals

AGC
Your Dreams, Our Challenge

- Integrated production of raw materials, intermediates and APIs using fine organic synthesis technology
- Efficient process development to enable low-cost, industrial-size contract manufacturing of intermediates and APIs

## synthetic agrochemicals
Flow of new drug development and marketing




(1) “Contract-based” business (CMO*)

(2) “Inquiry-based” business (CDMO**)

Functional design → Molecular design → Synthesis route development → Trial sample production → Trial mass production → Manufacturing → Marketing

## synthetic pharmaceuticals
Flow of new drug development and marketing

Functional design → Molecular design → Synthesis route development → GMP manufacturing (Investigational drugs) → GMP manufacturing (Commercial production) → GMP compatibility investigation → Marketing

(1) “Contract-based” business (CMO*)

(2) “Inquiry-based” business (CDMO**)

(3) “Co-development-based” business




* CMO (Contract Manufacturing Organization ）**CDMO（Contract Development Manufacturing Organization)

# Overview of CDMO services for biopharmaceuticals

AGC
Your Dreams, Our Challenge

- AGC receives the “target gene” from the client and performs the “cultivation”, “isolation” and “purification” processes on a contract-basis.
- The “target protein (=biopharmaceutical)” is produced. The flow of the manufacturing process are the same in both microbial and mammalian cells .

| Manufacturing process | Genetic transformation | Cultivation | Isolation | Purification | Marketing |
|---|---|---|---|---|---|
| | Introduce a recombinant gene into microorganisms/cells. | Increase microorganisms/cells carrying the recombinant gene. Then, the target protein (=drug) also increases. | Collect and purify the target protein (=drug substance) | | - |
| Responsible entity | Pharmaceutical company or contract manufacturing organization (e.g. AGC) | | | | Pharmaceutical company |
| (1) Microbial | Recombinant gene (=the seed of the target protein [=drug substance])<br>Size: several μm<br>Structure: simple | Target protein | Molecular weight: in the order of $10^4$<br>Structure: simple<br>Drug examples:<br>insulin (anti-diabetic)<br>GCSF (anti-neutropenic） | | - |
| (2) Mammalian | Recombinant gene (=the seed of the target protein [=drug substance])<br>Size: ≥10 μm<br>Structure: complicated | Target protein | Molecular weight: ≥$10^5$<br>Structure: complicated<br>Drug examples: antibodies (e.g. anti-neoplastics, anti-rheumatics), EPO (anti-anemic)) | | - |

# 30-year history of AGC's life science business

AGC
Your Dreams, Our Challenge

**1973** Launched The Life Science Team to investigate the applicability of AGC's fluorination technology to pharmaceutical/agrochemical production

## Events related to contract development/manufacturing of **synthetic pharmaceuticals/agrochemicals**

- **1985** Started contract manufacturing/supplying of fluorine intermediates for antibiotic for pharmaceutical companies
- **1989** Developed a method for synthesizing activated vitamin D3 and marketed the product after approval by the Ministry of Health
- **1990** Started co-development of prostaglandin derivatives with a pharmaceutical company at the request of Prof. Mizushima from St. Marianna University School of Medicine
- **1997** Established a trial production plant within Chiba Plant for GMP-compliant manufacturing of pharmaceutical/agrochemical intermediates/drug substances. Established AGC Wakasa Fine Chemicals.
- **2003** Established a GMP-compliant, multi-purpose facility for large-scale manufacturing of investigational medicinal products (CMP building) within Chiba Plant
- **2008** Obtained marketing approval for tafluprost, an anti-glaucoma drug substance co-developed with Santen Pharmaceutical
- **2013** Doubled the manufacturing line capacity for tafluprost. Established a new plant, Kaminaka Plant, within Wakasa Techno-Valley of AGC Wakasa Chemicals
- **2015** Doubled the production capacity of Kaminaka Plant of AGC Wakasa Chemicals
- **2019** Acquired Malgrat Pharma Chemicals (Spain) and planning to augument the production capacity of Chiba Plant by 10-fold

## Events related to contract development/manufacturing of **biopharmaceuticals**

- **1984** Formed the Biochemical Group focused on pharmaceutical development within the Research & Development Division
- **1997** Developed proprietary high-efficiency/high-speed protein manufacturing technology using Schizosaccharomyces yeast (ASPEX)
- **2000** Established a biotechnology-based drug manufacturing facility within the Central Laboratory to formally launch the contract protein manufacturing business
- **2000** Established the ASPEX Business Promotion Division to supervise the contract protein manufacturing business
- **2008** Established a new plant (ABP building) within Chiba Plant with 10-fold higher capacity for contract manufacturing of biopharmaceuticals
- **2016** Acquired Biomeva, a major German biopharmaceutical contract manufacturing organization (CMO)
- **2017** Acquired CMC Biologics, a CDMO of biopharmaceutical active ingredients with several manufacturing bases in Europe and US
- **2018** Augmented the production capacity in Berkley, U.S. and Denmark and established a new R&D center in Seattle, U.S.
- **2019** Planning to establish new animal cell-based manufacturing facilities in Chiba Plant
- **2020** Planning to augment the capacity of the mammalian cell-based manufacturing facility in Seattle, U.S. by 3-fold and establish new microbial manufacturing facilities

# Business locations

**Seattle**
**(United States)**
Acquisition in 2017
Mammalian facilities enhanced in 2019
Microbial facilities to be established in 2019

**Copenhagen**
**(Denmark)**
Acquisition in 2017
Mammalian facilities enhanced in 2018

**Chiba**
**(Japan)**
Mammalian facilities
to be established in 2019
Synthetic pharmaceutical facilities
to be expanded in 2019

# Business locations

| Company name | base | business |
|---|---|---|
| AGC | Chiba, Japan | Synthetic, Bio |
| | Yokohama, Japan | Synthetic, Bio |
| AGC Wakasa Chemicals | Fukui, Japan | Synthetic |
| AGC Biologics | Seattle, US | Bio |
| | Berkeley, US | Bio |
| | Copenhagen, Denmark | Bio |
| | Heidelberg, Germany | Bio |
| Malgrat Pharma Chemicals | Catalonia, Spain | Synthetic |

# 4. Requirements for CDMOs and AGC's efforts

# Requirements for CDMOs

## Requirements for CDMOs

(1)
Track record of commercial drug manufacturing

Capabilities to provide innovative proposals & Speed

(2)
Production system fit for customers' needs

(3)
Technical competence

# (1) Track record of commercial drug manufacturing

AGC
Your Dreams, Our Challenge

- Highly experienced CDMOs are chosen to fulfill the requirements for providing stable quality and the necessary technology.

<Track record of inspection at AGC's business locations>
(*including non-commercial drugs)

| | | FDA Food and Drug Administration | EMA European Medicines Agency | PMDA Pharmaceuticals and Medical Devices |
|---|---|---|---|---|
| Synthetic pharmaceuticals | AGC (Chiba, Japan) | ● | | ● |
| | Malgrat Pharma Chemicals (Catalonia, Spain) | ● | ● | ● |
| Bio pharmaceuticals | AGC Biologics (Seattle, US) | ● | ● | |
| | AGC Biologics (Copenhagen, Denmark) | ● | ● | ● |
| | AGC Biologics (Heidelberg, Germany) | ● | ● | |
| | AGC (Chiba, Japan) | | | ● |

# (2) Production system fit for customers' needs

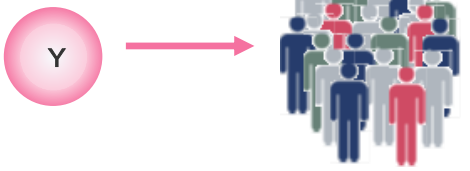
## a. Individualized medicine

**Traditional** pharmaceuticals: Mass/single-item production of low-response-rate drugs

Heterogeneous patient population → Determination of the drug to be administered → Low response rate

The drug to be administered is determined by "rough" diagnosis based on the affected site and symptoms

Drug to be administered




**Future** pharmaceuticals: Small-scale/multi-item production of high-response-rate drugs

Heterogeneous patient population → * Detection of biomarkers → Segmentation of patients → Determination of the drug to be administered → High response rate


*Biomarkers: Numerical/quantitative measures of biological information used to quantitatively evaluate biological changes

# (2) Production system fit for customers' needs

## b. Enhanced efforts to meet unmet medical needs

Medical needs for diseases for which no effective treatment/cure have been identified

| | Area where there is a "standard care" | "Unmet medical needs" area |
|---|---|---|
| | A category of treatments considered to be the best treatment currently available based on scientific evidence and recommended for a group of patients with a certain condition. | Medical needs for diseases for which no effective treatment/cure has been identified. These diseases include those affecting a large number of patients for which treatments are highly demanded, and **those affecting a limited number patients for which treatments/cures are still highly demanded.** |
| Satisfaction with current treatment | High | Low |
| Contribution of existing drugs | High | Low |
| Examples of target diseases | Hypertension, tuberculosis, allergic rhinitis, chronic hepatitis, angina pectoris | Cancer, Alzheimer's disease, Parkinson's disease, chronic kidney failure, autoimmune diseases, **rare diseases (orphan)** |

# (2) Production system fit for customers' needs

## c. Growth of the orphan drug market

- The CAGR of global prescription drug sales between 2018-2024 is estimated to be +6.4% ($830bn in 2018 → $1,204bn in 2024)
- The orphan drug market is expected to show prominent growth.
  From a technology standpoint, biopharmaceuticals are expected to lead the market's growth.

| | Synthetic pharmaceuticals | Biopharmaceuticals |
|---|---|---|
| Originals | New synthetic pharmaceuticals | New biopharmaceuticals |
| Generics | Generics | Biosimilars |

**New synthetic pharmaceuticals**

| | Sales($bn) | | CAGR |
|---|---|---|---|
| | 2018 | 2024 | 18-24 |
| Orphan | 101 | 181 | 10.2% |
| Non-orphan | 444 | 571 | 4.3% |
| Total | 545 | 752 | 5.5% |

**New biopharmaceuticals**

| | Sales($bn) | | CAGR |
|---|---|---|---|
| | 2018 | 2024 | 18-24 |
| Orphan | 37 | 81 | 13.9% |
| Non-orphan | 164 | 257 | 7.8% |
| Total | 201 | 338 | 9.0% |

+11.3%

**Generics**

| | Sales($bn) | | CAGR |
|---|---|---|---|
| | 2018 | 2024 | 18-24 |
| Non-orphan | 61 | 79 | 4.4% |

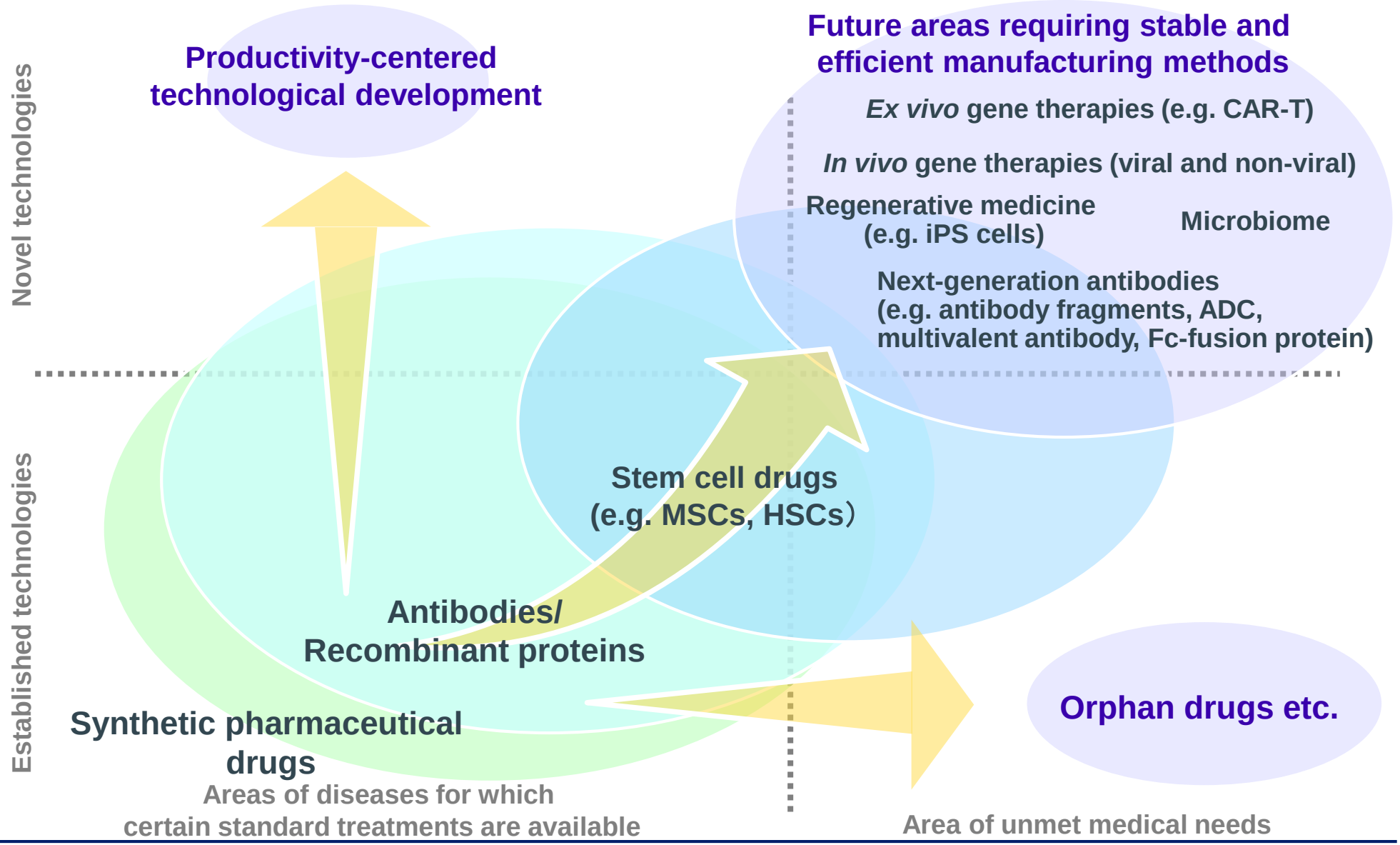
**Biosimilars**

| | Sales($bn) | | CAGR |
|---|---|---|---|
| | 2018 | 2024 | 18-24 |
| Non-orphan | 23 | 35 | 7.2% |

**AGC Biologics has the capacity and flexibility fit for small-scale/multi-item manufacturing needs**

Source: Values estimated by AGC based on data from EvaluatePharma® World Preview 2018, Outlook to 2024

# Future developments

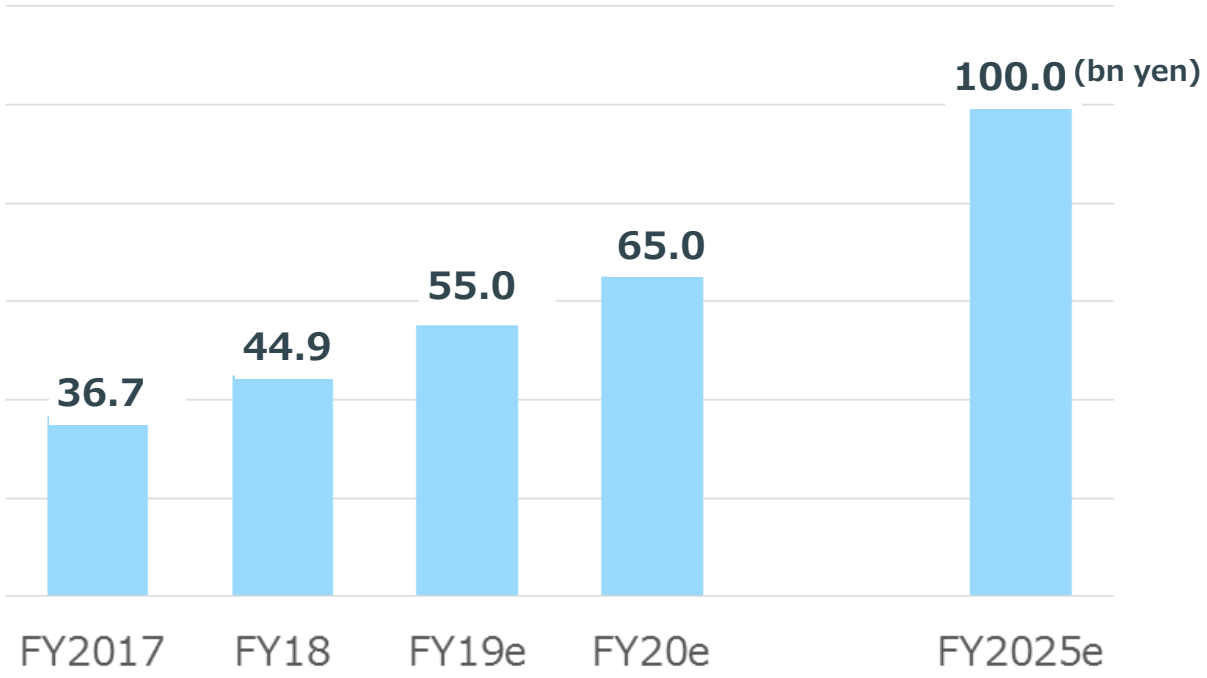


# Sales target towards "Vision 2025"

AGC
Your Dreams, Our Challenge

## Sales target for Life Science

| FY2020 | FY2025 |
|---|---|
| 65 bn yen or more | 100 bn yen or more |




### M&As, facility expansions

| | |
|---|---|
| 2016 | **Acquired** Biomeva (Heidelberg) |
| 2017 | **Acquired** CMC Biologics (Copenhagen・Seattle・Berkley) |
| 2018 | **Expanded** mammalian capacity in Denmark |
| 2018 | **Expanded** mammalian capacity in Berkley |
| 2019 | **Acquired** Malgrat Pharma Chemicals |
| 2019 | **Expanded** capacity of synthetic in AGC Chiba(starting in FY2019) |
| 2019 | **New construction** of mammalian facility in AGC Chiba(staring in FY2019) |
| 2020 | **Expanded** mammalian capacity in Seattle(starting in FY2020) |
| 2020 | **Expanded** microbial capacity in Seattle (starting in FY2020) |

# Disclaimer

- This material is solely for information purposes and should not be construed as a solicitation. Although this material (including the financial projections) has been prepared using information we currently believe reliable, AGC Inc. does not take responsibility for any errors and omissions pertaining to the inherent risks and uncertainties of the material presented.
- We ask that you exercise your own judgment in assessing this material. AGC Inc. is not responsible for any losses that may arise from investment decisions based on the forecasts and other numerical targets contained herein.


# END