Yaohabio
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Yaohai Bio-Pharma

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PART ONE

Company Overview

About Us

- Founded in 2010, located in **China Medical City**
- The 1st and Biggest microbial CRTDMO, end-to-end solution provider in China
- 500 team members

Services:

- Focus on recombinant proteins, peptides/polypeptides, enzymes, antibody fragments and nano-antibodies, plasmid DNA and mRNA, virus-like particle (VLP)…
- Meet global customers' clinical and commercial needs in biological drugs, biosimilars, vaccines and diagnostics for human and veterinary use

Platform:

- cGMP Production Platform **7500+L**, 20, 000+m² plant
- The largest GMP-level Plasmid supplier in China
- **High-potency** Manufacturing Suite
- Bio-Safety Level 2 (**BSL-2**) lab for CDO

Global Market

Global Biologics CDMO Market

PRESCIENT & STRATEGIC INTELLIGENCE
Where knowledge inspires strategy

Market Growth Will Accelerate at a **CAGR (2021–2030)**

10.3%

2021
$13,173.7 Million

2030
$31,839.7 Million

MARKET SIZE

>44% APAC Held the Largest Market Share

GROWTH DRIVERS

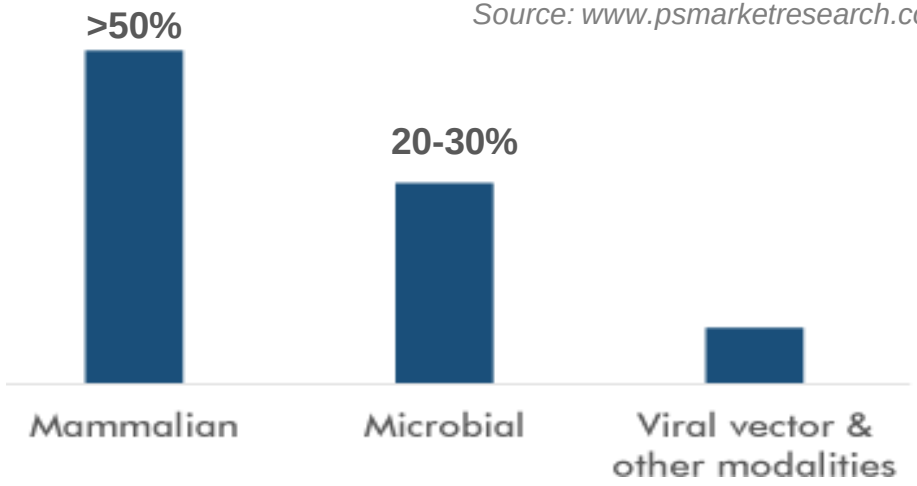
- Heavy investment in healthcare infrastructure
- Increasing and aging population.

CDMO Market Growth Rate by Region (2022-2027)

Source: Mordor Intelligence

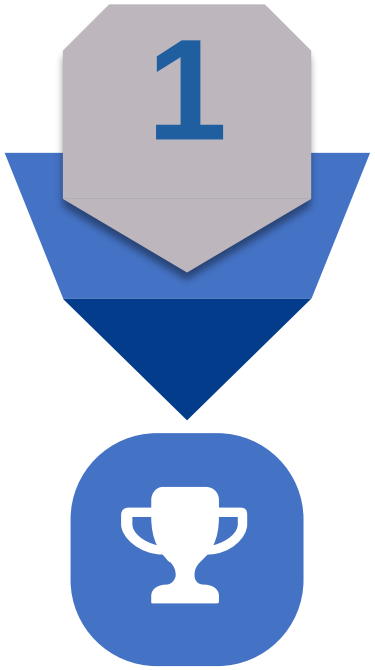
Global CDMO Market By Cell Line Type $Million (2021)

Source: www.psmarketresearch.com



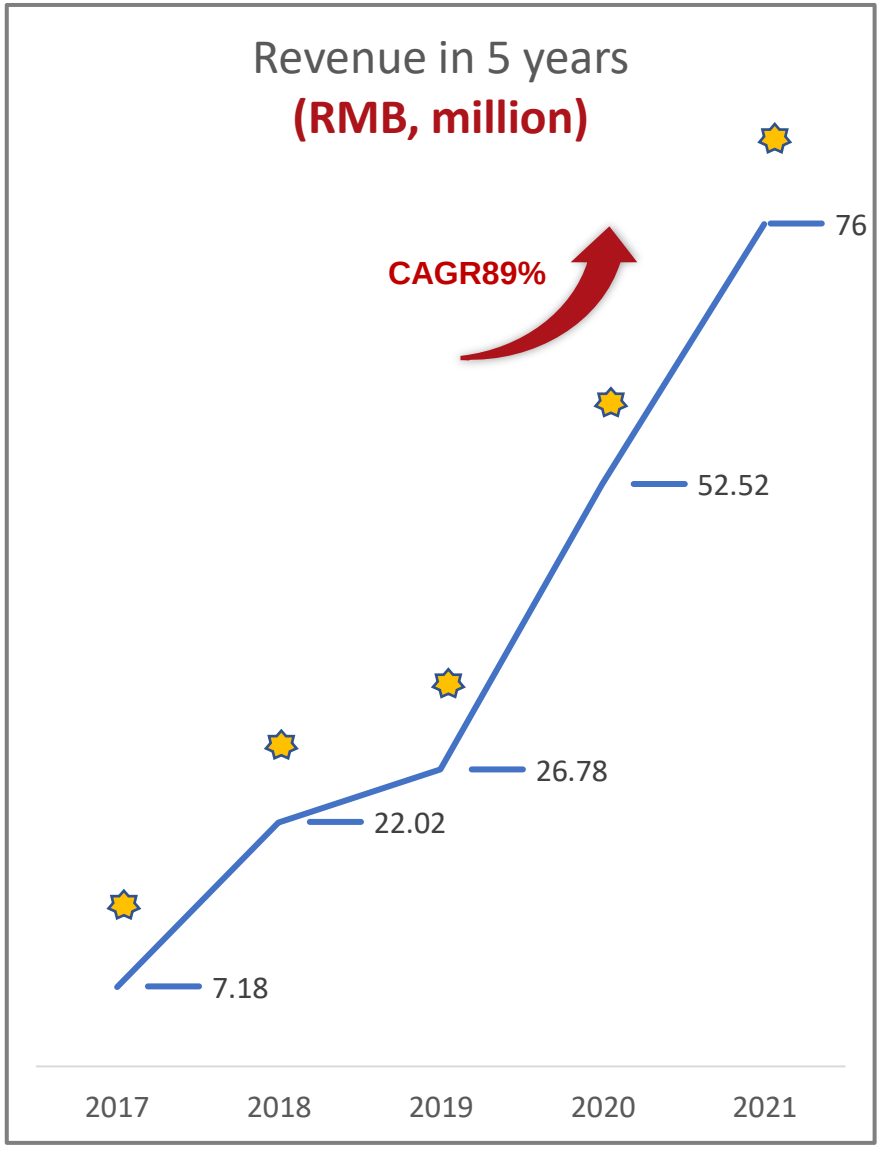
Position In The Industry

The First and Largest CDMO in Microbial expression system in China.



Top 1
Number of serviced projects

Top 1
Scale of production capacity (7500+L)



Existing Capabilities

G27

8, 000 m², in production

DS Workshop I: **50-500L**, DS Workshop II: **50-200-1000-2000L**

DP Workshop I

G29

10, 000 m², in production

DS Workshop III: **50-100L**, DS Workshop IV: **50-500L**,

DS Workshop V: **50-200-500-2000L**,

DP Workshop II, Quality Control center

Vaccine Engineering center

1, 000 m² , in production

Process Development Center

G23

3, 000 m² , in production

YHNB (IVD), Innovation Center

Beijing Branch

Nucleic acid drugs and Nano-bodies CRO/CDO

Quality research service

Core raw materials development

FDA/EU Industrialization Standard

Technical Capacities

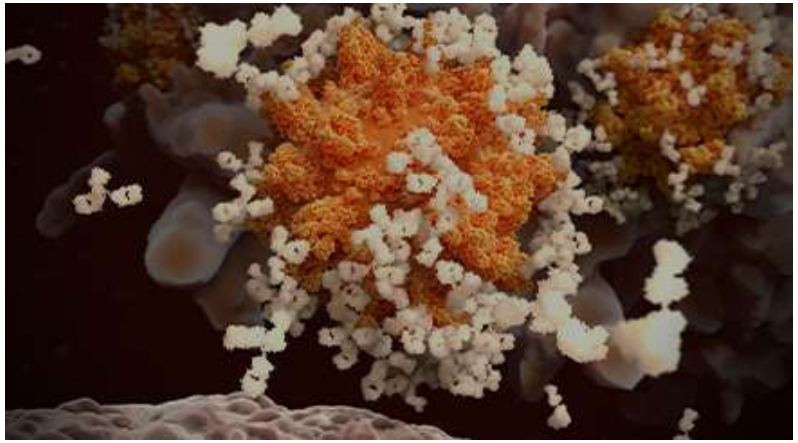
Yaohai Bio-Pharma delivers end-to-end biopharmaceutical services, with focuses on recombinant protein, nucleic acid drug and nanobody. With high efficiency and flexibility, Yaohai provides global biotechnology companies with CDMO services such as process development, IND-CMC pharmaceutical research, GMP production of clinical samples, registration application, etc., to serve customers with solutions for the whole process from DNA to commercial production. Yaohai is engaged in providing efficient and feasible CDMO services and solutions to customers and facilitate the R&D of new drugs.

Recombinant Protein

End-to-end CDMO service platform for recombinant protein/polypeptide drugs

Nucleic Acid Drug

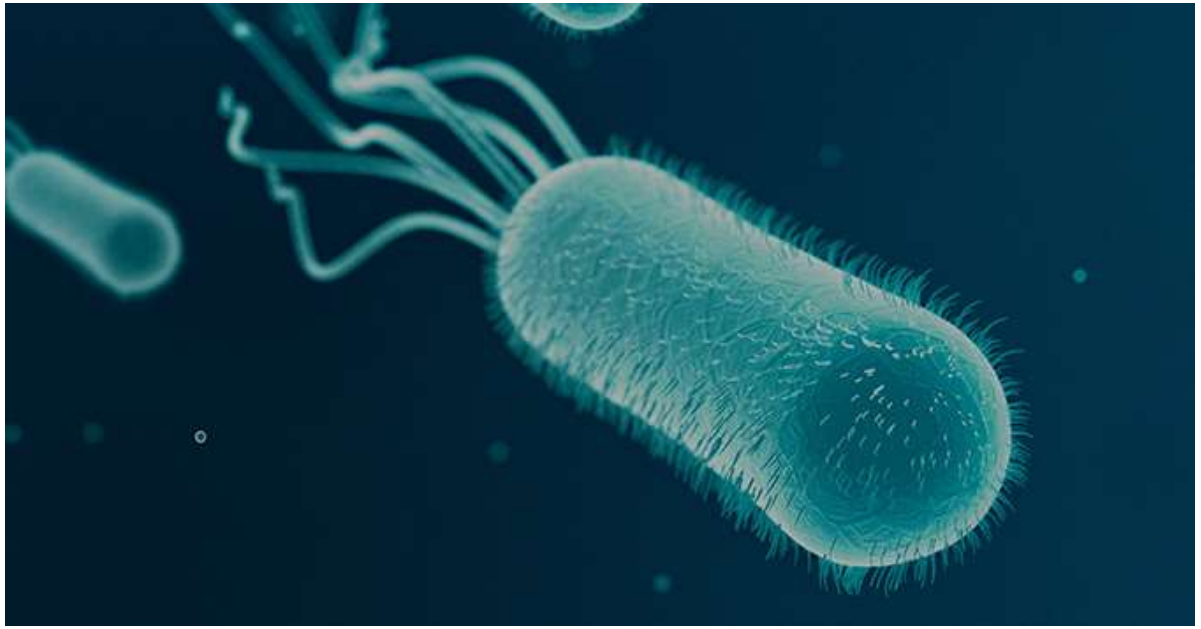
Focusing on the use of plasmid and mRNA, accelerating the progress from R&D to clinical application



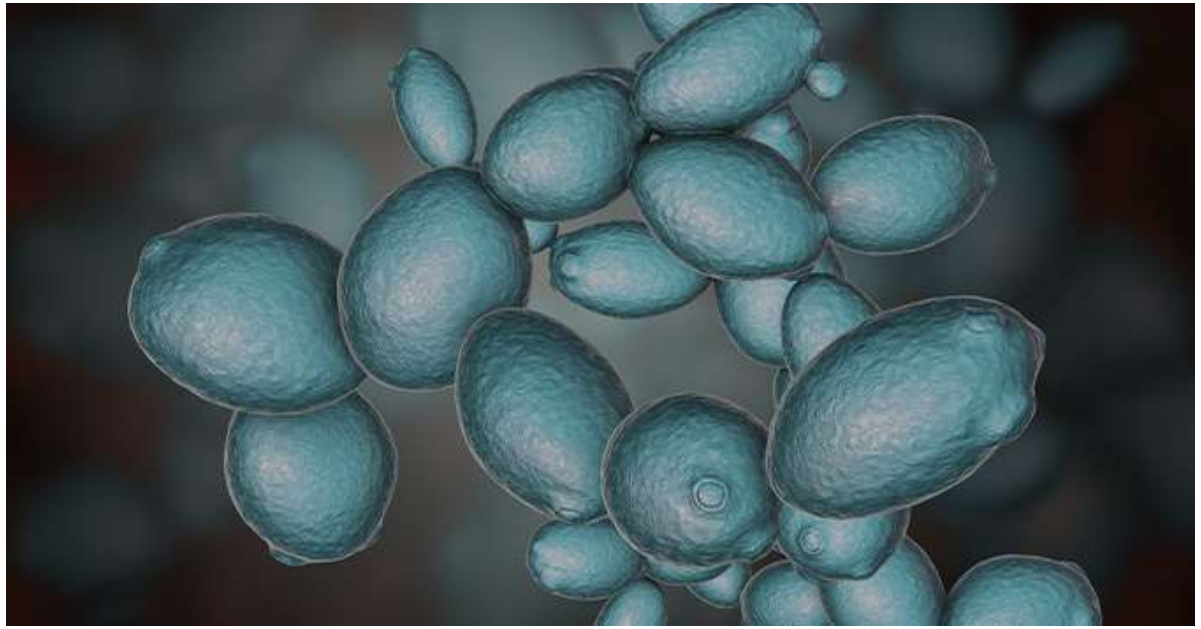
Nanobody

Global expression platform

Expression Systems



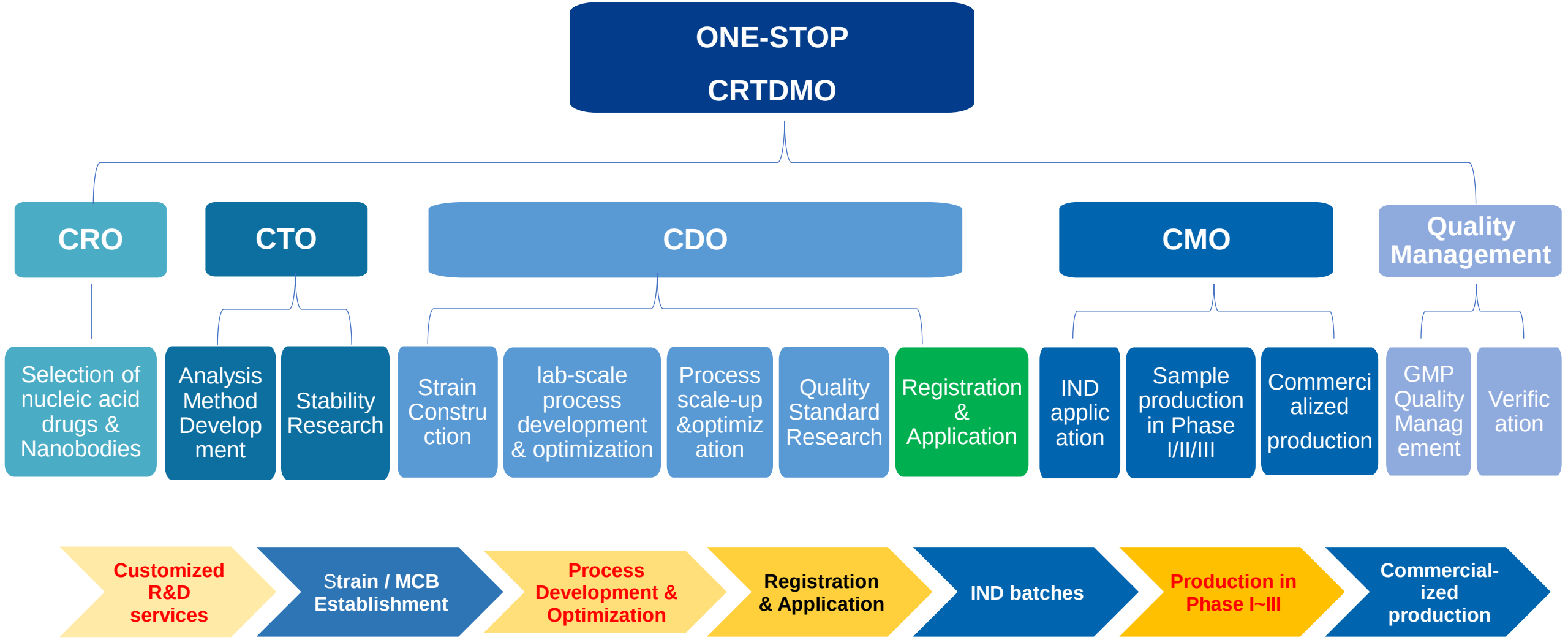
E. Coli



Yeast Expression
Pichia Pastoris, Han Nicholson, etc.

Yaohaibio has an integrated CMC development and cGMP production process platform to produce recombinant proteins, plasmids, and antibody fragments with *E.coli* and yeast expression systems, or the bacterial strains provided by clients.

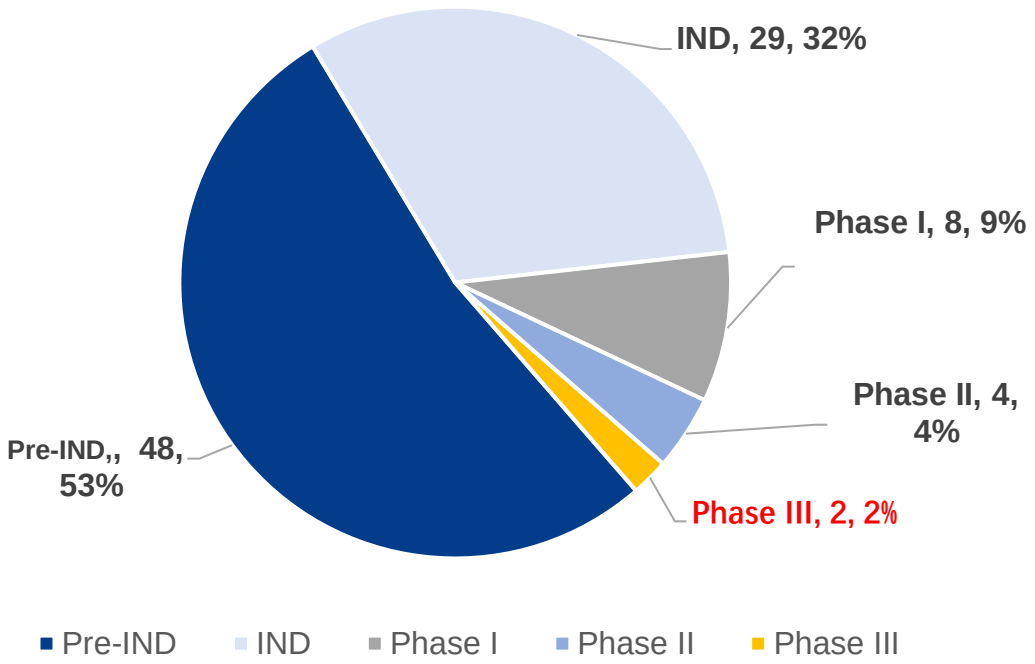
Service System



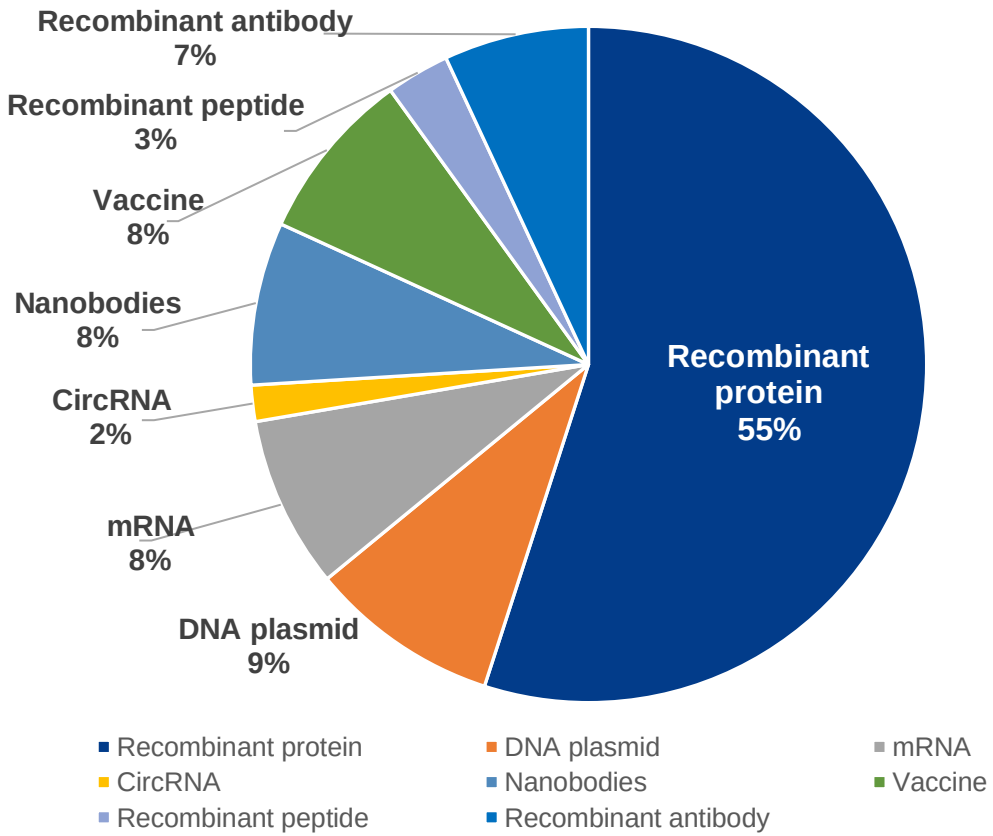
Cooperated Projects

US-China application	EU-China application	AUS-China application	CAN-China application
7	1	2	1

Based on project phase



Based on project type



Core Services

Strain Construction & Strain Bank Establishment

- Strain construction
- GMP secondary strain library (WCB+MCB) establishment

Process Development & Optimization

- **Fermentation process** development & optimization
- **Purification process** development & optimization
- **Preparation process** development & optimization
- Related product preparation

GMP Compliance Scale-up Production

- **Fermentation** scale-up & production
- **Purification** scale-up & production
- **Preparation** production
- Preparation of standards

Method Development & Quality Control

- **Quality standards** research
- **Method** development & validation
- Sample commissioned testing
- **Stability & compatibility research**

Core Service-Filling Production





Workshop	Equipment	Dosage Form	Specification Range	Maximum Output
1500m² Aseptic preparation workshop in accordance with GMP requirements for Any Modalities (biologics, vaccines, chemicals…)	Filling speed: 2ml vial 160~300 vials/min, 10ml vial 140~200 vials/min Lyophilization capacity: 2ml 37800 vials (4200 * 9 layers) 10ml 20043 vials (2227 * 9 layers)	Pre-filled injectables Lyophilized powder injections Eye drops Oral solutions Inhalation formulations	**1-25mL**	Annual production: **10 million** injection (vials) **5 million** lyophilized powder for injection (vials)

Service Advantages

We provides comprehensive biopharmaceutical end-to-end services with focuses on recombinant protein, nucleic acid drug and nanobody, delivers CDMO services including process development, IND-CMC pharmaceutical research, clinical sample GMP production, registration application, etc. And offers efficient and flexible solutions for the whole process from DNA level to commercial production.

Professional leadership & team

Employees have an average of more than 5 years of industry experience, providing services, and promote the project progress with efficiency and coordination.

Well equipped

GMP production base with Drug Production License, with 2-2000L automatic fermentation system to provide high qualified and diversified fermentation purification service.

Highest level of quality compliance

Successfully passed FDA, NMPA, TGA and MFDS inspections

Highly experienced & Efficient DS/DP Supply Chain

100+ clinical projects, 200+ commercial projects under negotiation.

Service Process & period

CTO

Analytical service	Period
Quality Specification establishment	10 days
Analytical development	10-90 days
Analytical method transfer, Qualification/Validation	5-30 days
Sample testing	1-30 days

CDO

Strain and cell banking	Period
Gene synthesis Plasmid construction Strain construction High-yielding strain screening	30 days
GMP Master Cell Bank (MCB) generation	3 days
GMP Working Cell Bank (WCB) generation	3 days
Testing	45 days

CDO

Process development	Optimization scale-up	Period
Fermentation development	Fermentation Optimization scale-up	60-90 days
Purification development	Purification Optimization scale-up	60-90 days
Sample testing		45 days
Process confirmation	Process confirmation	45 days

CMO

Process Transfer	Full production	Period
Fermentation process Transfer Confirmation	Fermentation process Production	Depending on different process
Purification process Transfer Confirmation	Purification process Production	Depending on different process
Formulation process Transfer Confirmation	Drug product Production	Depending on different process
Method transfer Quality comparison	Release testing	15-45 days

Equipment For PD


1


2


3


4


5

6

1 –Sartorius BIOSTAT C full-automatic Bioreactor-30L

2 –Quadruple fermentation system made by Bioengineering AG -7L

3 – GE AKTA System

4 –BIO RAD Gel Imaging System

5 – qPCR made by ThermoFisher

6 –SCIEX capillary electrophoresis;

Equipment For DS

Fermentation system 2000 L

Disc centrifuge

High pressure homogenizer

Automatic buffer Configuration/storage system

High-potency Manufacturing Suite

High pressure chromatography

Sterility Isolator

Hollow fiber system

Equipment For QC

HPLC
Thermo (U3000/Vanquish)

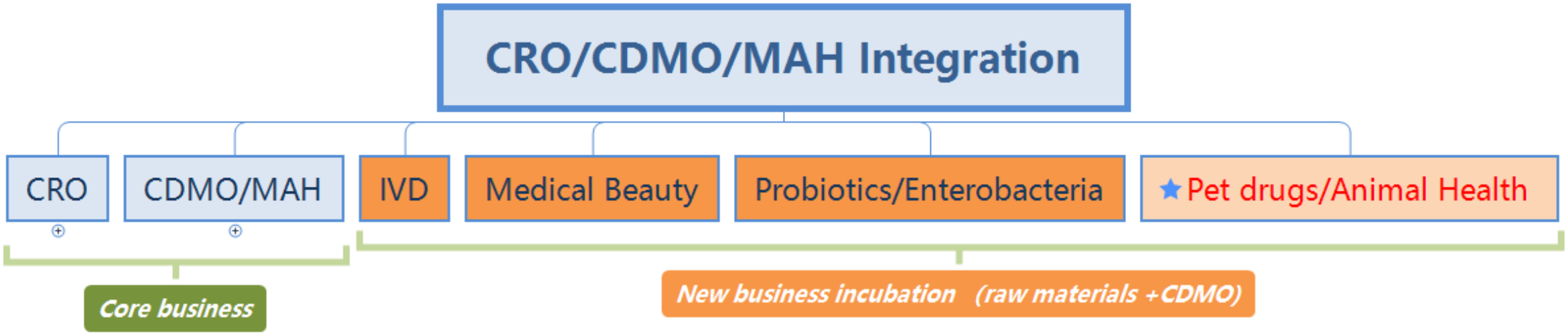
HPLC
Agilent 1260

Molecular
Devices iD3

GC
Agilent 8890

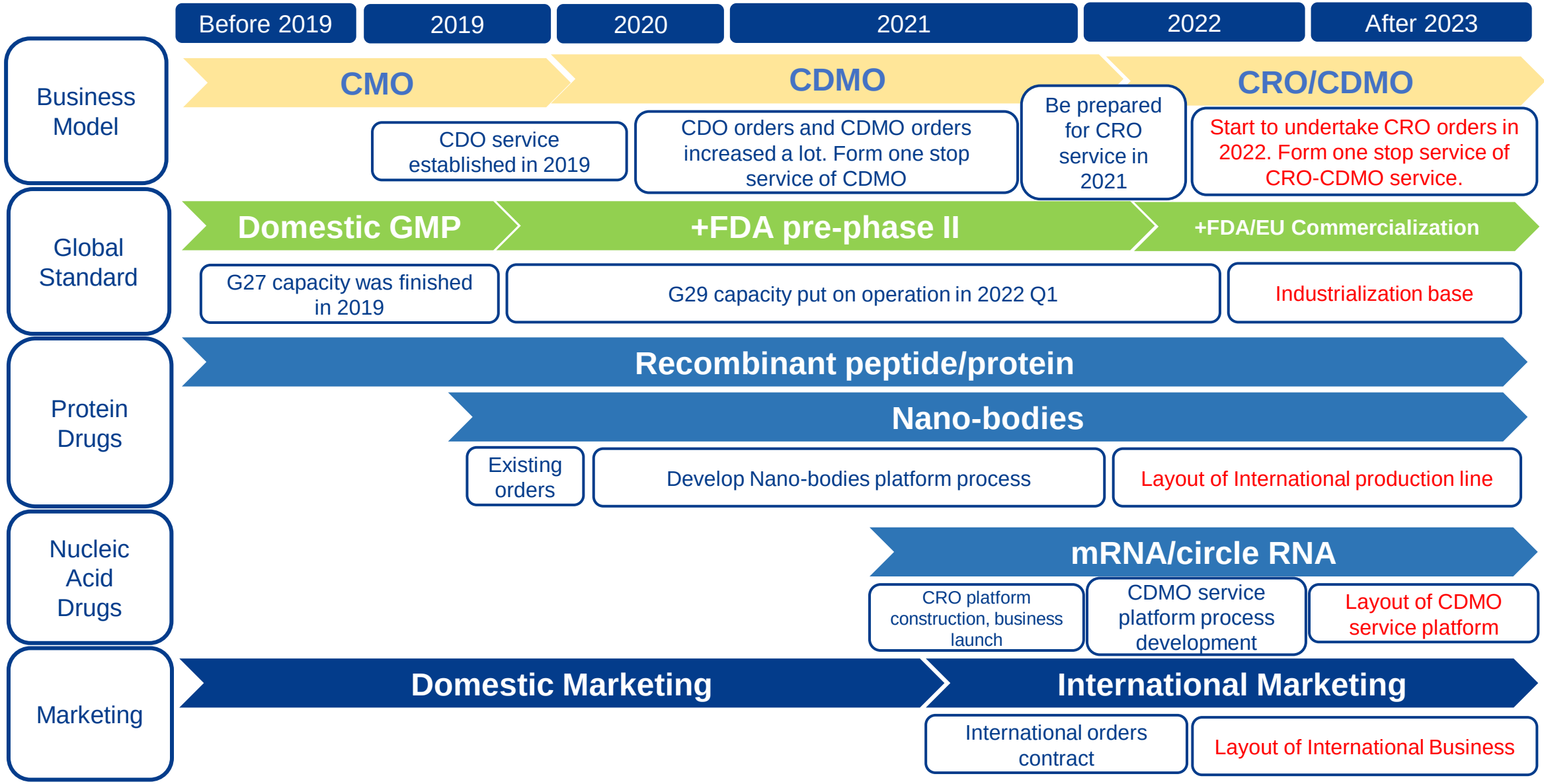
QPCR
ABI QuantStudio5

Strategic Planning



- ◆ Extend service chain
- ◆ Form CRO/CDMO integration
- ◆ Promote the comprehensive competitive advantage of technology and scale
- ◆ Based on the microbiology expression and cultivation
- ◆ Raw material and CDMO service integration
- ◆ Give full play to the comprehensive advantages of talent and microbial track

Strategic Planning



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PART TWO

Department Services

Drug Substance Service

20, 000 m² Plant with

GMP standard, including four areas

◆ **Strain area (C level)**

◆ **Fermentation area (D level)**

◆ **Purification area (C level)**

◆ **Explosion-proof area (C level)**

Multiple scales of bioreactor

◆ **50L, 100L, 200L, 500L, 1000L, 2000L**

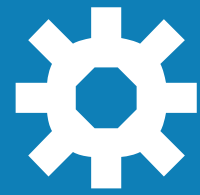
Drug Substance Service

Strain Bank Establishment within GMP system

Pilot-scale Process Optimization, Scale-up and Production

Production of Sample Preparation Batch for IND Registration Application

Sample production for Phase I-III Clinical Trial



FDA/NMPA Industrialized Production

Standards Preparation

Drug Production Experience

Services

1. **Preparation products** of injection/ lyophilized powder for injection(vials)

2. IND sample preparation
   Clinical Phase I-III sample production
   MAH consigned production

3. Meets the requirements of sterile drug product of China NMPA, EU EMA, and US FDA

Experiences

Product Categories:

Peptides
Proteins
Plasmids
Recombinant vaccines
Other standard drug products

Project Phases:

pre-IND
IND
phase Ⅰ
phase Ⅱ
phase Ⅲ

Research Platform

“RNASci“ mRNA & circRNA research-grade sample preparation service platform

The platform contains four major technology modules: RNADes (RNA structure design and optimization platform), RNASyn (RNA synthesis and modification platform), RNAPur (RNA purification platform), and RNAQua (RNA quality analysis and control platform), which run through the whole lifecycle of circRNA design to sample formation.

RNADes

RNA structure design and optimization platform

RNA Synthesis and Modification Platform

RNASyn

RNAPur

RNA purification platform

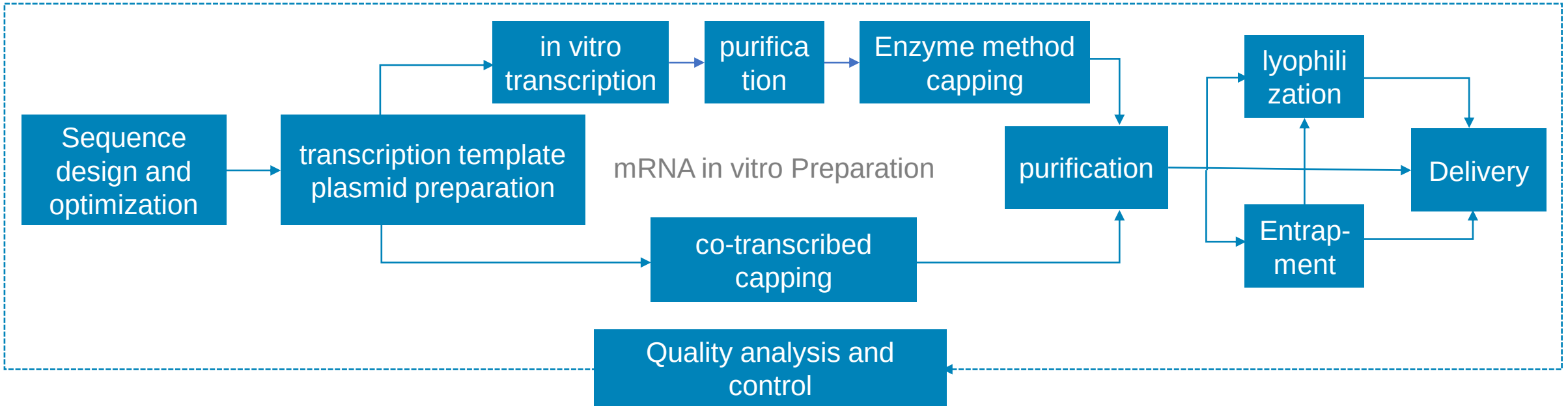
RNA quality analysis and control platform

RNAQua

Research Platform

Scientific research level sample preparation service of mRNA

The outbreak of the COVID-19 in 2020 has pushed the mRNA technology to the center of the stage, and the related research is unprecedentedly popular. It has developed rapidly in infectious disease prevention, tumor treatment, protein replacement therapy, regenerative medicine, cell therapy and other fields. YaohaiBio has launched the “RNASci” mRNA scientific research level sample preparation platform, providing one-stop services for mRNA preparation, which runs through the whole life cycle from mRNA design to sample preparation, and comprehensively energizes the research and development of mRNA vaccines and drugs.



Development Platform

01 RECOBINANT PROTEIN development platform

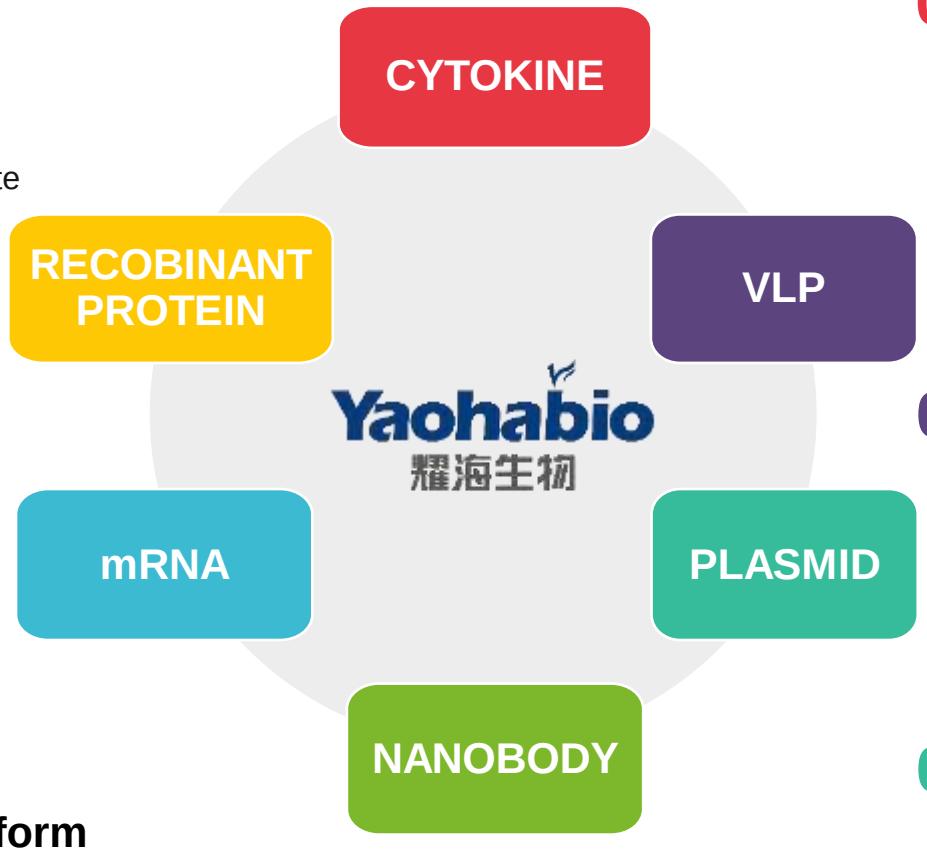
- 50+ projects
- **92%+**successful historical delivery rate
- Platform-based screening process

02 mRNA development platform

- Customized sequence design & optimization
- Multiple mRNA pre-products on sale, such as **EGFP**
- **15+**cooperative partners including universities, enterprises, institutions

03 NANOBODY development platform

- Full-ecological recombinant expression system of *E. coli*, yeast, mammalian cell
- Multi-valent: monovalent, bivalent, trivalent
- High Yield: up to **8g/L**



06 CYTOKINE development platform

- Specialized teams for list of strains
- **7** related project experiences, involving **interleukins, interferons, thymidine, insulin and its analogues**, etc.

05 VLP development platform

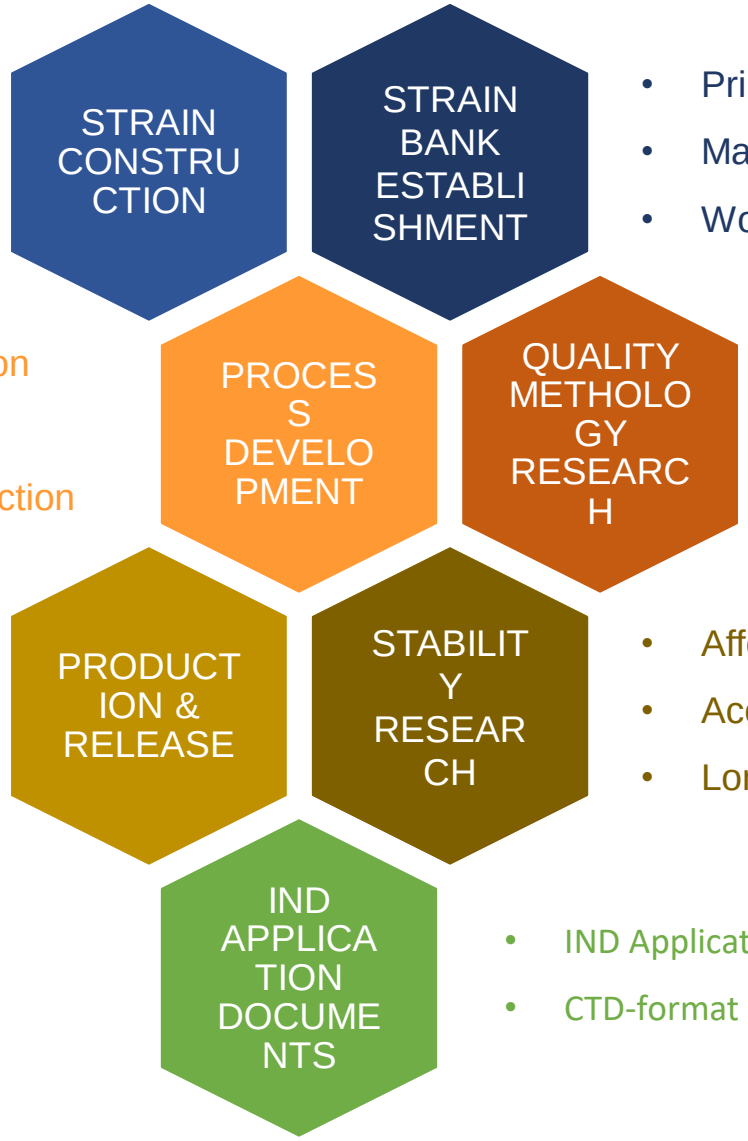
- Experienced in vaccine development
- Multi-valent: bivalent, tetravalent, 9/15-valent
- Multi-category: virus, phage,

04 PLASMID development platform

- **20+** multi-category projects, including bare plasmids, mRNA templates, gene therapy materials, vaccines
- Experienced in **industrialization: 2** clinical phase **III** projects

Development Platform

ONE-STOP INTEGRATED SOLUTIONS



- Gene Synthesis
- Vector Construction

- Primary Cell Bank (PCB)
- Master Cell Bank (MCB)
- Working Cell Bank (WCB)

- Fermentation
- Purification
- Drug production

- Analysis Method Development
- Analysis Method Validation

- Production
- Release Test

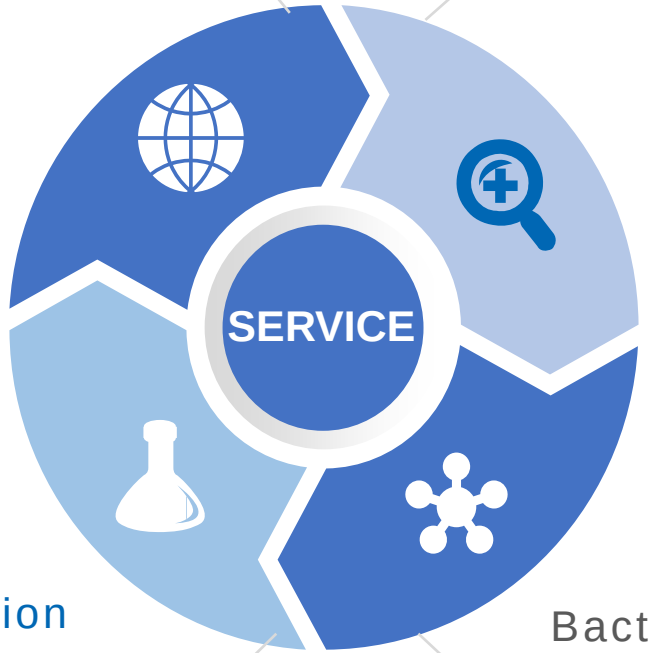
- Affecting Factor
- Acceleration
- Long-term Stability Research

- IND Application
- CTD-format Document

Pilot-Scale Service

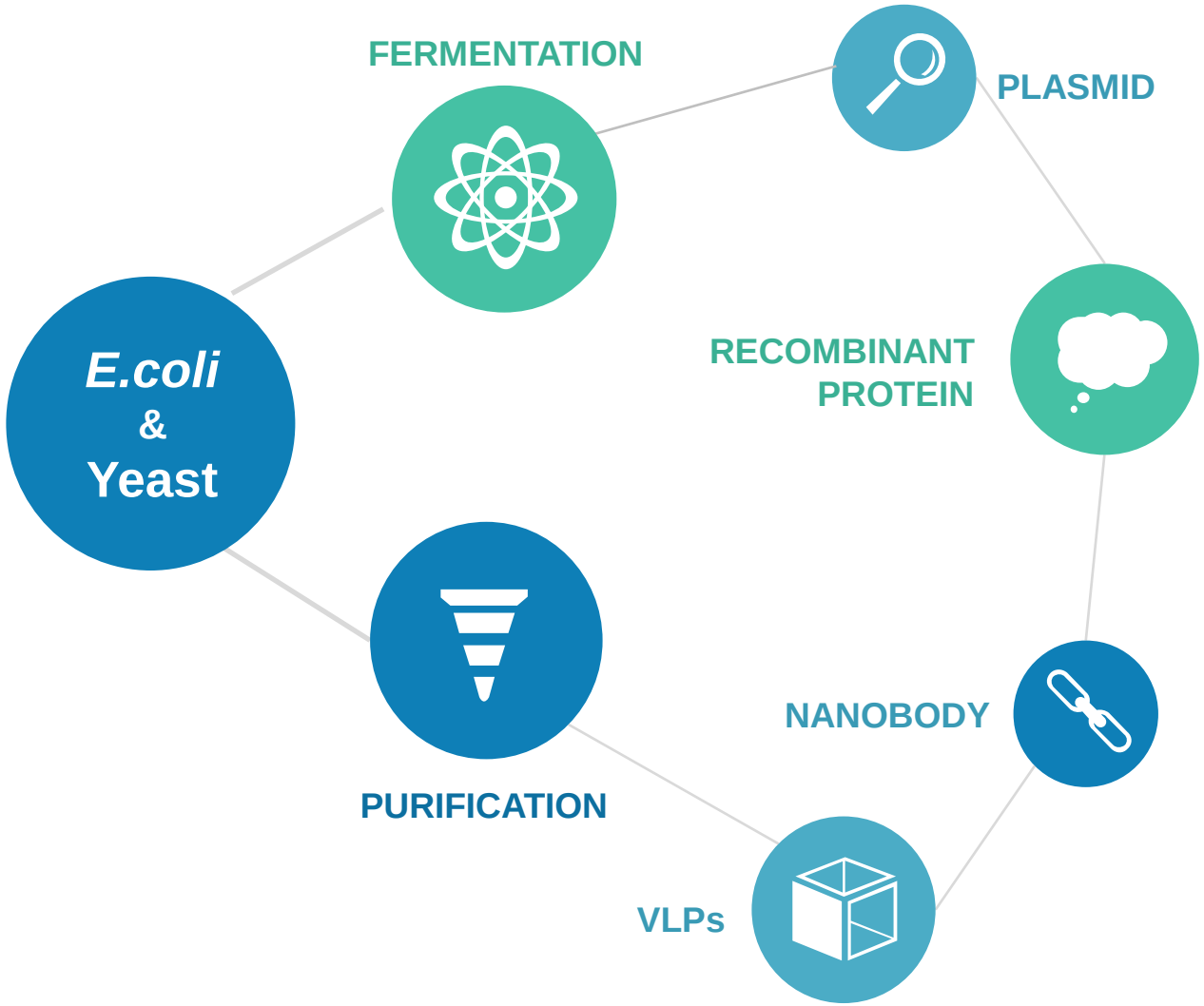
Fermentation pilot-scale process development & validation (30L/ 69L)

Purification pilot-scale process scale-up & validation



Purification sample preparation

Bacteria Pellet preparation



Quality Management

R&D QA Department

- The review of record files, the control of process exceptions and changes, make the process of the entire R&D project traceable.
- R&D record management to ensure the authenticity and reliability of the original records.
- The whole process of quality management and risk management of R&D experimental projects ensures the implementation of the R&D quality system and the continuous improvement in the later stage.

Registration Compliance Department

- Responsible for the review and approval of drug registration materials for CRO projects, including biopharmaceutical new drug applications, various supplementary applications, etc.
- Assist R&D to standardize various experimental projects

from the perspective of registration

- Responsible for communicating with clients of entrusted projects and following up on various entrusted trials related to drug registration

Scientific and efficient **R&D Quality Management** **Unity of responsibility and power**

Quality Management

Document/ Records Management

1. Review documents and records as required to ensure the uniqueness of all plans, reports, records and ledger numbers in the R&D process;
2. Supervise the writing and filing of records, establish a complete variety file, and provide data support for later reporting.

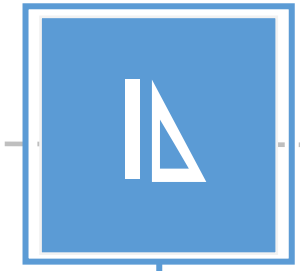
Instrument/Equipment

1. According to the specific use of the equipment, the equipment is managed by grades;
2. Regular measurement and verification to ensure the accuracy of all experimental data

Regular on-site inspection

R&D site management

1. R&D QA regularly conducts on-site inspections of experiments to ensure the integrity of equipment, on-site operations, and instrument use records;
2. Do a good job of cleaning management on site according to the document requirements;
3. Material control: can control different materials according to the requirements of laws and regulations.



Abnormality, change & other documents

Process supervise & control

1. Investigate the abnormal situation in the process of research and development in time and record it completely;
2. Changes generated in the research and development process, according to the specific situation of the assessment change, confirm that it is enough to change the process

Quality System Testing Capability

Category	Biochemical Testing	Physicochemical Testing	Microbiological Testing
Items	Expression of target product	Appearance	Plasmid Loss Rate
	Digestion Profile of Plasmid	PH	LB Plate Streak
	Protein Content	Visible Impurity	Resistance to Antibiotics
	Purity	Loading Capacity	Biochemical Reaction
	Molecular Weight	Insoluble Particles	Antibiotics Residues
	Activity Testing	Osmotic Pressure	Bacterial Endotoxin
	Exogenous DNA Residues	Water Content	Microbial Limits
	Host Bacteria Protein Residues		Asepsis
	Isoelectric Point		
	Ultraviolet Spectrum	**30 testing items and 50 testing methods are used in routine items testing.**	
	Peptide Mapping		
	Identify		

Registration Service

With the experienced drug registration application service team, Yaohaibio provides high-qualified, efficient and accurate registration services including IND/BLA application home and abroad, CMC consultation, registration application strategy guidance, preparation and submission assistance in CMC-related CTD documents, communication assistance with official authorities, on-site inspection guidance, training and conference on drug registration regulations organization. The core members of the registration team have abundant registration experience, in-depth understanding of registration-related regulations in China and aboard, and provide comprehensive guidance on regulations and strategy in full life cycle of product development.

Registration Service

Registration Service

- Committed To CMC Regulatory Consulting Services
- Provide Guidance On CMC Strategy Making And Gap Analysis For Domestic And International Registration Applications
- Assist In Communicating With Regulatory Authorities, Responding To Approval Comments And Submitting Supplementary Documents
- Assist In Communication On Matters Related To Registration And Inspection
- Assist In The Collation, Review, Filing, Binding, Submission, Etc. Of Registration Application Documents
- Organize Meetings, Including CDE Consulting Meetings Of Types 1, 2, And 4 As Well As Other Meetings (Including The Submission Of Meeting Requests, Preparation Of Meeting Documents, And Attend The Meeting To Assist The Customers In Communicating With The Regulatory Authorities)

Preparation Of Application Documents

- Preparation Of IND And NDA Application Documents
- Flexible And Customizable Registration Application Document Preparation Service

Registration Service

On-Site Inspection

- Review Of Guidance On The Documents Preparation
- On-Site Review Of Guidance On The Drug Registration

Regulatory Support Matrix

- Research On Regulations From Drug Regulatory Authorities Worldwide
- Regulatory Strategy & Implementation Guidance
- Sorting And Interpretation Of General Regulations And Individual Regulations
- Year-Round Routine Regulatory Consultation
- One-To-One Regulatory Consultation
- Project Management

Other Value-Added & Special Services

- Project Demonstration During Project Technology Development Or Transfer
- Analysis Of IND/NDA Application Strategy
- Research And Assessment Of Special Varieties

Registration Service Advantage

Professional Team

The core members have rich experience in drug registration and project management for over 10 years.

Multi-module expertise, numerous professional operation experience, and strong professional support from domestic and foreign experts.

Real-time Information Sharing

Familiar with every communication channel of official authorities

Regularly collect the latest regulatory trends

Fully understand the laws and regulations

Share the information after integration and analysis with a powerful regulatory database and document template database.

Full Life Cycle Service Management

One-stop service chain, covering the establishment of R&D system, IND and NDA application, project management

Implement the full lifecycle of drugs management concept in the full course of the project.

Abundant Project Operation Experience

Served more than 200 customers

Pre-evaluate the difficulties of projects and improve project efficiency significantly on the back of abundant project experience and skilled understanding of regulatory guidelines, review requirements and drug registration points.

Project Management Improvement Service

Provide full life cycle planning and guidance service and feasible suggestions, focus on risk management and budget control, formulate practicable solutions to ensure project quality.

Registration Experience

80+ application strategies for protein-based drugs

200+ compliance guidance during R&D and manufacturing

50+ application strategies for gene-based drugs

100+ on-site inspection guidance

Serve whole-heartedly and create the future together

Yaohaibio will live up to your trust!

Jason Soung

Director, International Business Development

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