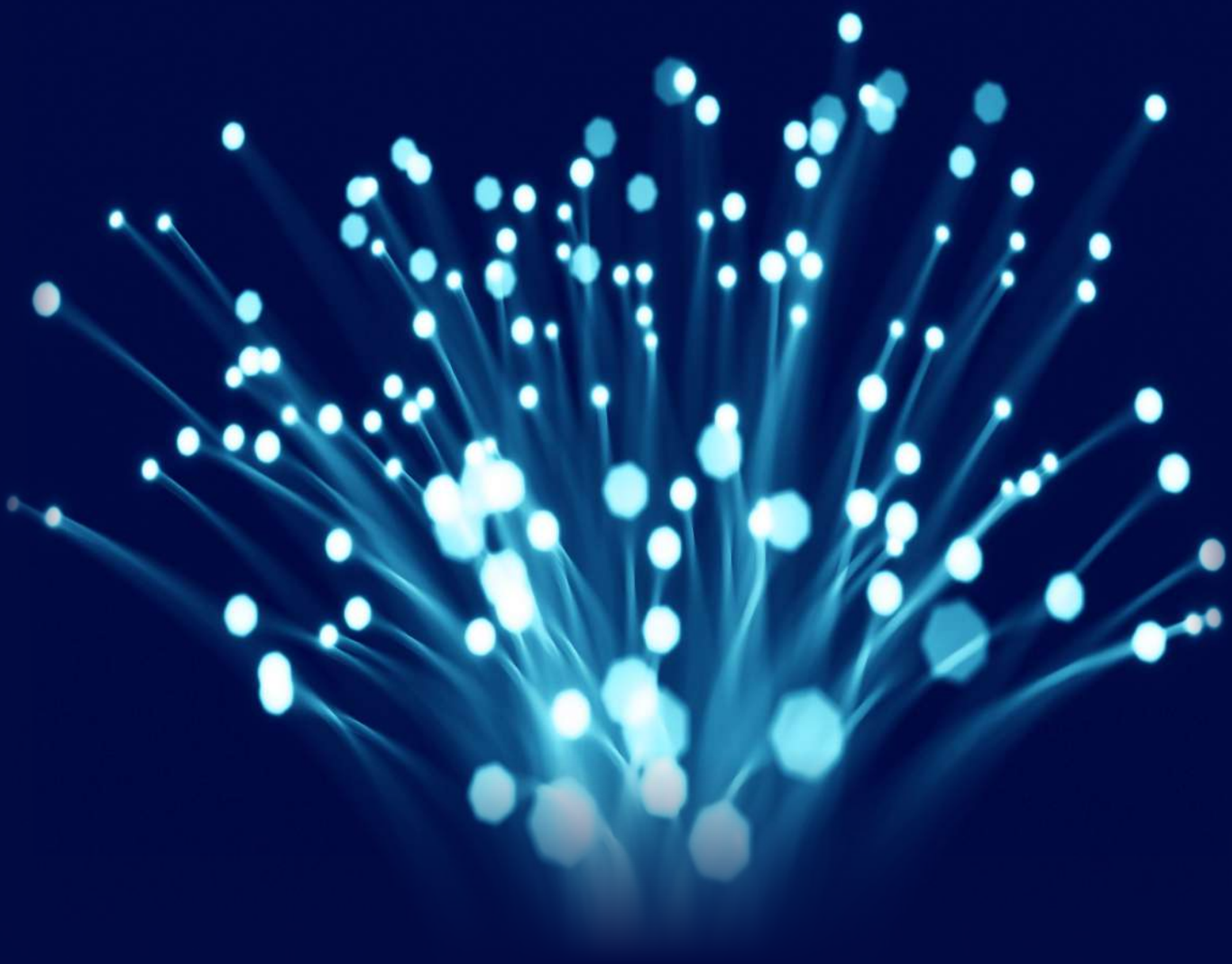
NAVIGATING GLOBAL MARKETS

A deep dive into the Chinese pharmaceutical industry global expansion



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iDeals

Empower Biopharma Innovation

Accelerate Decision-making

Founded in 2015, Pharmcube strives to reconstruct pharmaceutical data, bridge the information gap, and thoroughly empower innovation. By leveraging data across the full life-cycle of pharmaceutical products plus scalable and highly compatible AI technology, Pharmcube has successfully launched over ten enterprise-level data products, serving 1,000+ leading pharmaceutical companies and investment institutions.

We also provide you with media and consulting services that facilitate your strategic planning and decision-making and promote the innovation and transformation of the pharmaceutical industry.

Our Industry Influence

Our trustworthy data and constantly-improving service have won client's heart.

We Are Growing

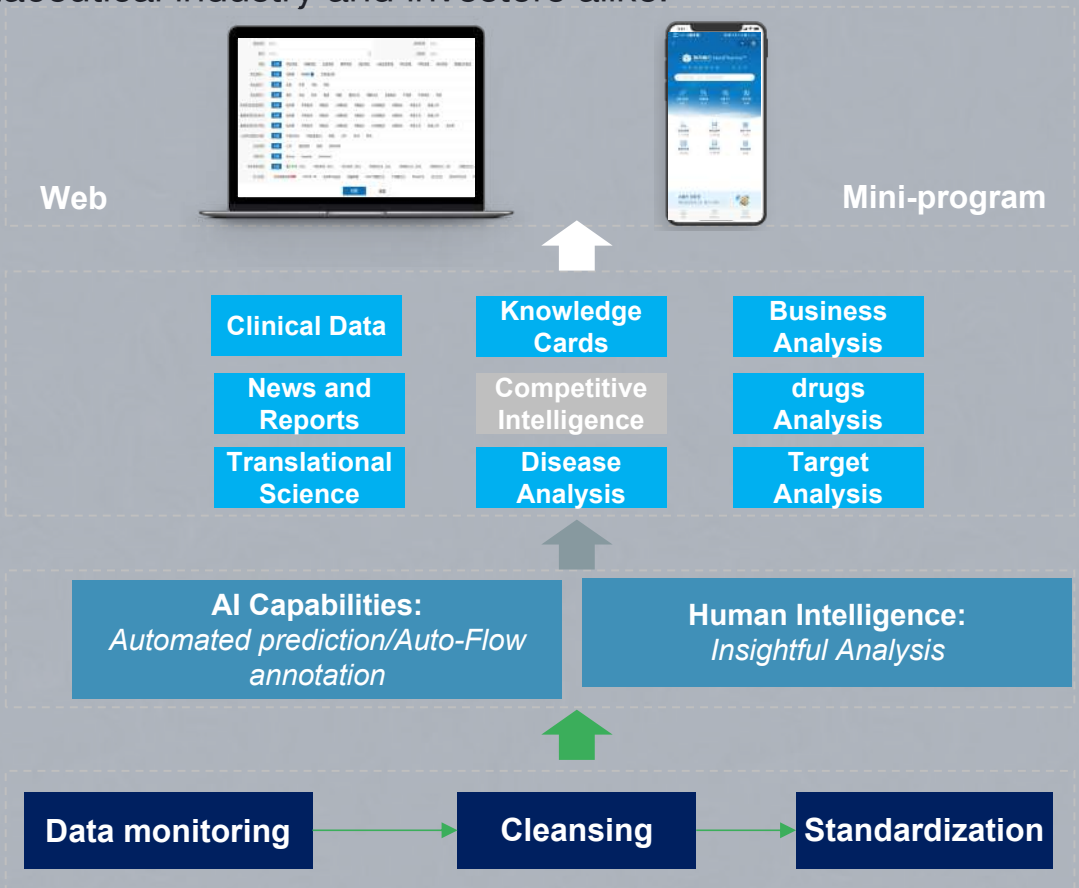
We team up with top talents. Over 56% master or Ph.D holders, and more than 60% top university graduates (such as Peking University, Tsinghua University, Fudan University or Shanghai Jiao Tong University), around 10% of them receive education in overseas universities. Our team of data specialists have not just experience but also the spirit to innovate.

NextBiopharm™--Timely, accurate and reliable intelligence on global new drugs

"Introducing NextBiopharm™, a cutting-edge database meticulously crafted and launched by Pharmcube, designed specifically to spotlight global new drugs with unparalleled coverage in the Chinese market.

This platform seamlessly integrates and standardizes a wealth of information, including patents, literature, clinical trials, news, deals, and marketing data, providing a comprehensive overview of every novel molecule worldwide.

As a proud member of the Pharmcube family, NextBiopharm™™ is well linked with other offerings such as NextPat®, PharmaGO®, MedAlpha®, etc., ensuring a robust connectivity that caters to the diverse needs of the pharmaceutical industry and investors alike.



iDeals VDR Empowers 75% of Out-licensing Deals

As BD transactions become more frequent and active, the virtual data room (VDR) becomes an indispensable tool for information interaction at a time when distances make information interaction inconvenient and the process of building trust very lengthy.

iDeals Solutions provides a comprehensive VDR solution, which is as a powerful assistant for BD transactions in the biopharmaceutical industry:

- It simplifies the process of sharing and managing sensitive and confidential documents.
- Its financial-grade document security solution ensures that the company's confidential documents meet the most stringent compliance requirements in BD transaction usage scenarios.
- Empowers the entire process of corporate BD transactions, including protecting data security, supporting due diligence and auditing, enhancing transaction efficiency, improving transaction transparency, and reflecting an efficient professional image.

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Contact us:

- About Product/Service

  daisiwei@pharmcube.com

- After-Sales

  sanyunan@pharmcube.com

- For Media Collaboration

  zhangxiaoyi@pharmcube.com

iDeals Contact us:

john.yuan@idealscorp.com

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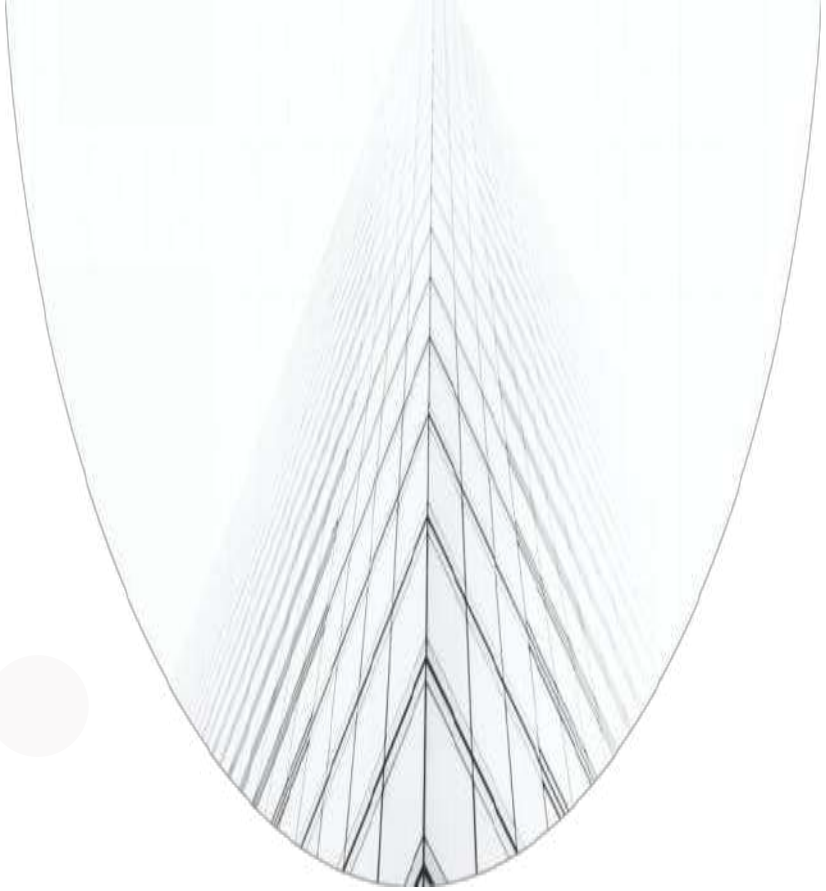


PART ONE

Factors Compelling Chinese Pharmaceutical Companies to Go Global

In recent years, Chinese pharmaceutical companies have been taking the initiative to tap into the global market as a result of a number of factors.

Intense competition within the Chinese market is driving companies to seek out opportunities for survival space in overseas markets.

The medical insurance payment reform and restricted hospital access have squeezed the profit margins of innovative drugs. Additionally, some sectors within the industry have witnessed fierce competition surrounding homogeneous products. Consequently, some Chinese companies are turning to the global market for new growth space and stronger profitability.

Faced with financial challenges, many companies are choosing to seek investment and collaborate with others in order to stay in business.

The pharmaceutical industry is experiencing downward pressure, with most companies having difficulty in funding and cash flows. In light of this, relinquishing a portion of their interests in the overseas market in return for cash and subsequent funding presents an advantageous survival strategy for most companies.

With growing strength in R&D of new drugs, Chinese companies show stronger global competitiveness.

As more talents return to the Chinese market and innovation factors accumulate, China-originated biotechs are stepping into the global spotlight, which is attributed to greatly improved capabilities in new drugs R&D and outstanding potential in rapid target translation and best-in-class (BIC) / first-in-class (FIC) R&D.

Government policies encourage Chinese companies to accelerate their quest for international development.

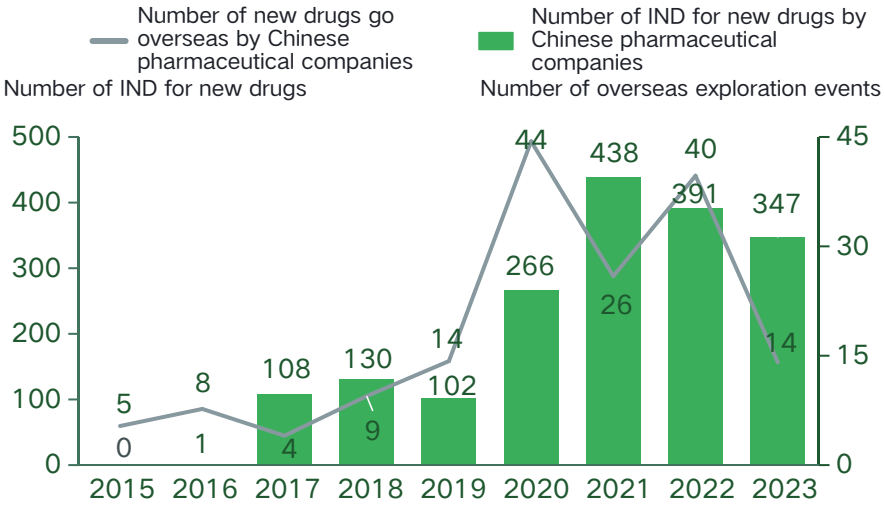
China's pharmaceutical industry has entered a new stage of development. In recent years, national regulatory policies have aligned with international standards and encouraged Chinese companies to explore overseas markets, in order to speed up innovation-driven development and allow for better integration into the global industrial system.

Source: Research and analysis by Pharmcube

In recent years, Chinese pharmaceutical companies have been taking the initiative to tap into the global market as a result of numerous factors.

In recent years, Chinese companies have exhibited a greater capability in R&D of innovative drugs. The number of investigational new drugs (IND) has noticeably risen, resulting in an increased number of new drugs being exported overseas.

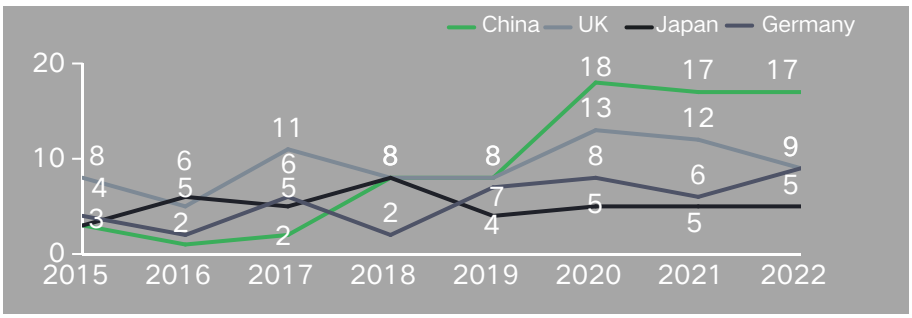
The number of Investigational New Drug Application versus international expansion events by Chinese pharmaceutical companies in recent years



China ranks the second in the world, after the U.S., in terms of the number of milestone publications, surpassing Germany, the UK, and Japan.

The historical number of breakthrough translational medical researches in China, Japan, and Europe

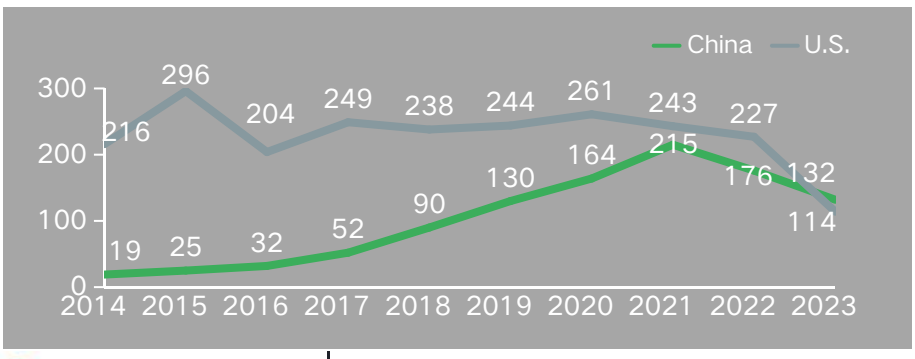
Note: Breakthrough translational medical research refers to milestone papers in the field.



In this respect, Chinese pharmaceutical companies are closing the gap with their counterparts in the U.S. , showing annually enhanced capability in R&D of innovative drugs.

Number of pivotal clinical trials conducted by pharmaceutical companies in China and the U.S. in the last decade

Source: Research and analysis by Pharmcube; NextBiopharm™ database; data as of July 25, 2023.



Government policies support Chinese pharmaceutical companies in accessing overseas markets and expanding into internationally recognized brands.

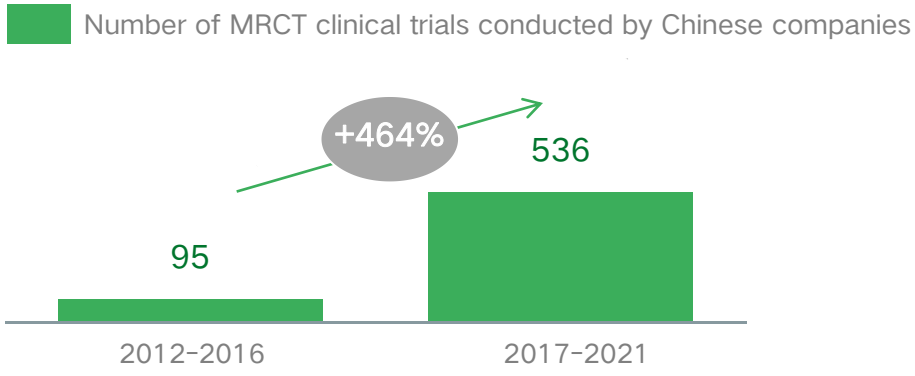
Beginning: Initial exploration of the global market

In 1990, regulatory authorities and international associations in the EU, U.S., and Japan created the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) to enhance the technical requirements for drugs registration via harmonization.

In June 2017, the former China Food and drugs Administration (CFDA) joined ICH, marking the official start of China's international journey in pharmaceutical regulation and development.

1. Guiding Chinese companies to align with international standards in the design of clinical research and the development of new drugs
2. Adopting the to widely recognized CTD format to diminish repetitive work and lower cost for companies and enhance their success in international registration
3. Accepting overseas clinical trial data, thus pushing Chinese companies to bolster their R&D capacity and quality of drug products remain competitive

Number of MRCT conducted by Chinese pharmaceutical companies before and after China joined ICH over a five-year period.



Developing: Proactive development towards internationally recognized brands

Central

In December, 2021, six government departments jointly released the *Notice on the Development of the Pharmaceutical Industry during the 14th Five-Year Period*

During the 13th Five-Year Plan (FYP) period, China's pharmaceutical industry underwent a gradual shift towards higher added value. During the 14th FYP period, a primary objective for Chinese companies is to emerge as world-class pharmaceutical companies. Moreover, the 14th FYP has highlighted the significance of upholding openness and cooperation, striving to explore the global market, participating in international industrial distribution and collaboration at a higher level.

Local

Since 2019, eight biomedicine industrial bases have issued policies to bolster industry progress.

Expanding the global presence has been a key focus of China's policies in supporting the development of the pharmaceutical industry.

Coverage	Content	Examples
 Awarding successful applications	Eight cities offer a proportional grant to products approved by globally recognized institutions for the first time.	Shenzhen offered a grant of up to RMB 5 million for products verified by the United States Food and drugs Administration (FDA) or the European drugs Agency (EMA) (the exact amount was determined by involving professional auditing companies).
 Facilitating custom clearance	Four cities offer advantageous conditions and support for controlled items to enhance R&D and improve supply chain.	Shanghai facilitated the customs clearance of R&D materials and specific special items. It also strengthened security regulations through a piloted joint regulation for the exit and entry of special items at the border.
 Supporting cooperation	Two cities facilitate Chinese companies in engaging in business partnerships with multinational companies.	Beijing supported Chinese companies specializing in innovative drugs to authorize multinational companies for technological research and establish commercial partnerships for product development. It provided a grant to Chinese companies, amounting to 20% of the upfront payment for each product, with a maximum cap of RMB 5 million.

1.The eight major biomedicine industrial bases in China include Beijing, Shanghai, Suzhou, Hangzhou, Chengdu, Wuhan, Guangzhou, and Shenzhen.

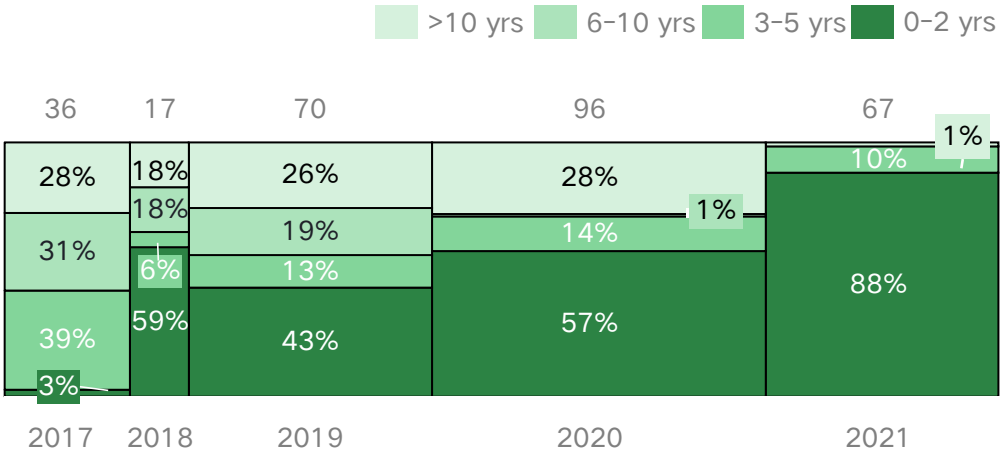
Source: Research and analysis by Pharmcube; Government websites.

Pharmaceutical companies encounter development obstacles in the Chinese market, primarily consisting of a cap on medical insurance pricing and limited hospital accessibility.

Medical insurance

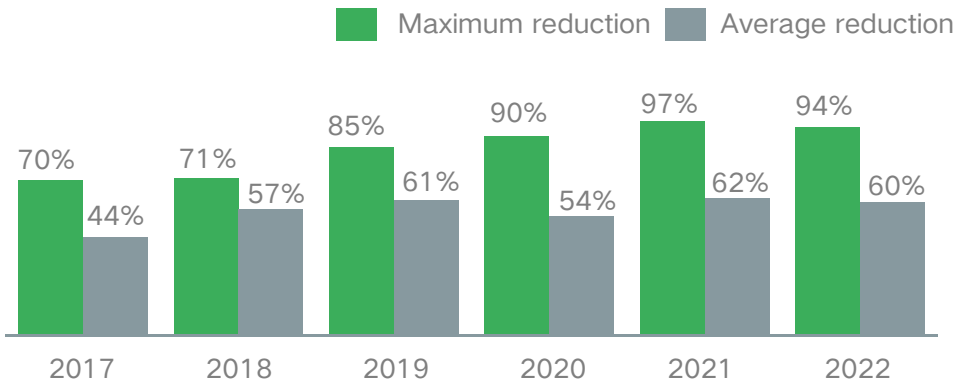
It takes years for a newly launched drugs to be included in medical insurance through negotiation.

The average time for a newly approved drugs to be covered by health insurance is decreasing each year.



Price reduction as a result of medical insurance negotiation.

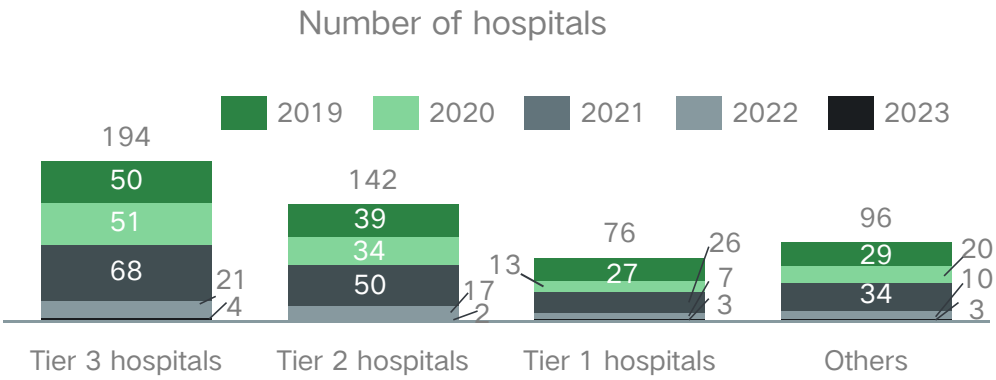
Medical insurance negotiations have applied significant pressure on the reduction of prices.

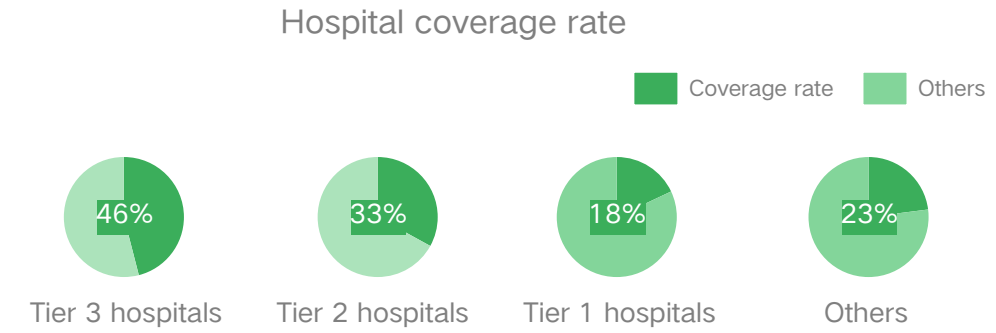


Source: Research and analysis by Pharmcube; PharmaGo database; data as of July 2023.

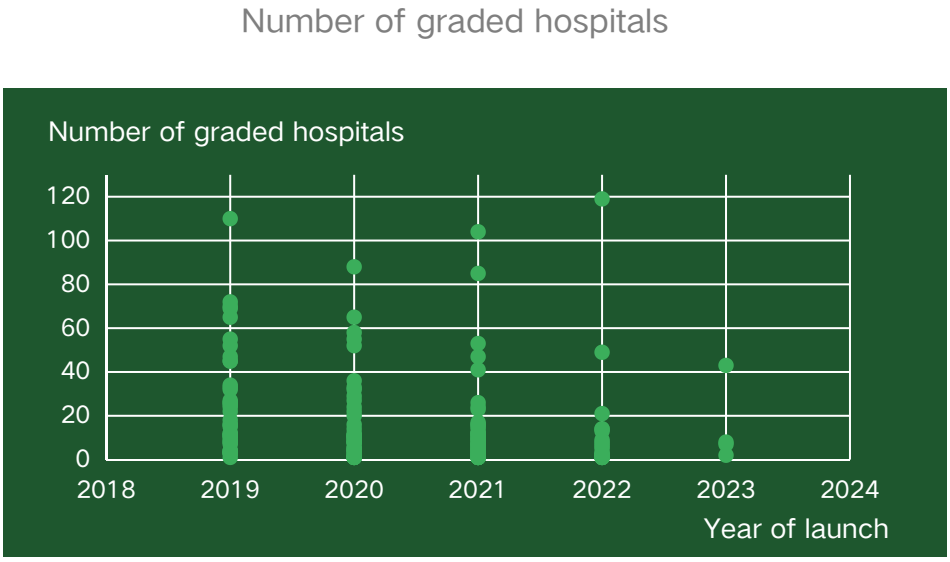
Hospital accessibility

New drugs allowed for use in public medical institutions in Beijing within the past five years





Number of new drugs allowed into graded hospitals in Beijing from 2019 to 2023

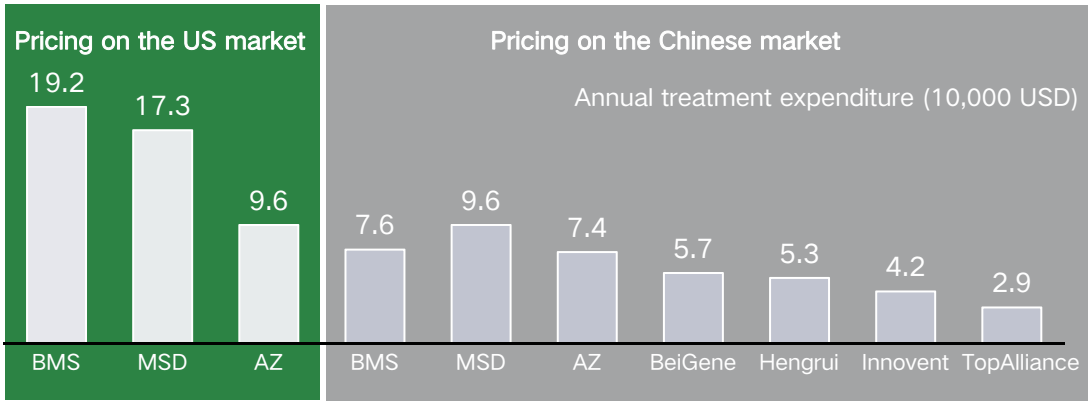


Source: Research and analysis by Pharmcube; PharmaGo database; data as of July 2023.

Under the dual pressure of product pricing and domestic competition, Chinese pharmaceutical companies are seeking to expand their growth horizons and to make breakthroughs by turning to overseas markets.

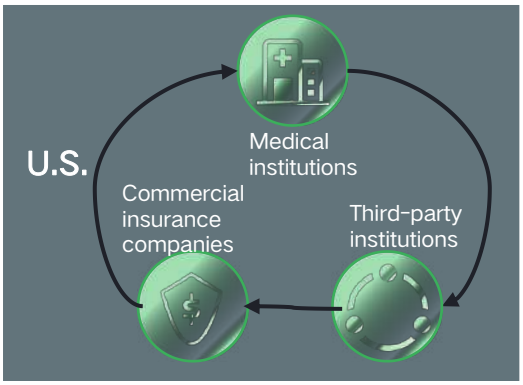
Annual expenditure for treatment with PD1 products in China and the U.S.[1]

Unlike in the U.S. where drugs are priced based on their value, drugs in China are generally priced based on their cost, resulting in lower prices and significantly squeezed profit for pharmaceutical companies.



Different procedures for accessing hospitals in China and the U.S.

China and the U.S. have contrasting procedures for authorizing access of new drugs to hospitals. The Chinese procedures are complex and time-consuming, while the three-party model in the U.S. makes it easier for companies.

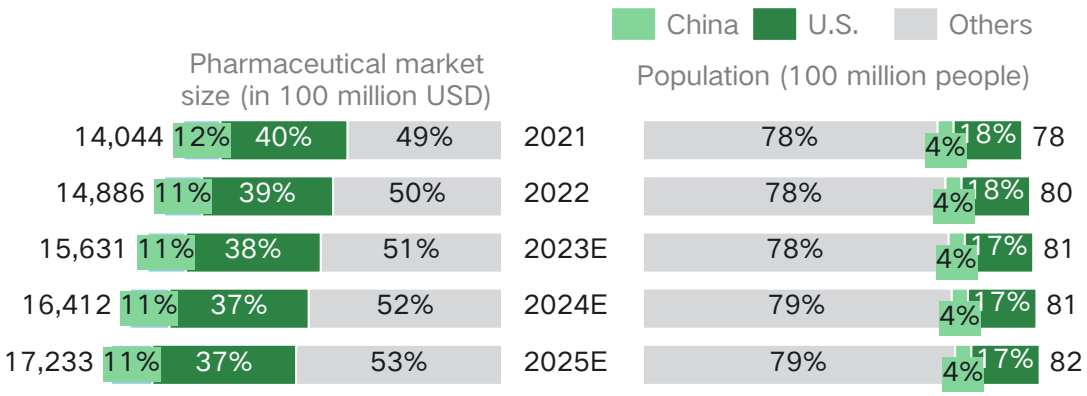


1 Availability and Affordability of Oncology drugs in 2012-2021 in China and the United States

Source: Research and analysis by Pharmcube; Company annual reports; Desk research materials.

Global pharmaceutical market size and population structure in 2021-2025E

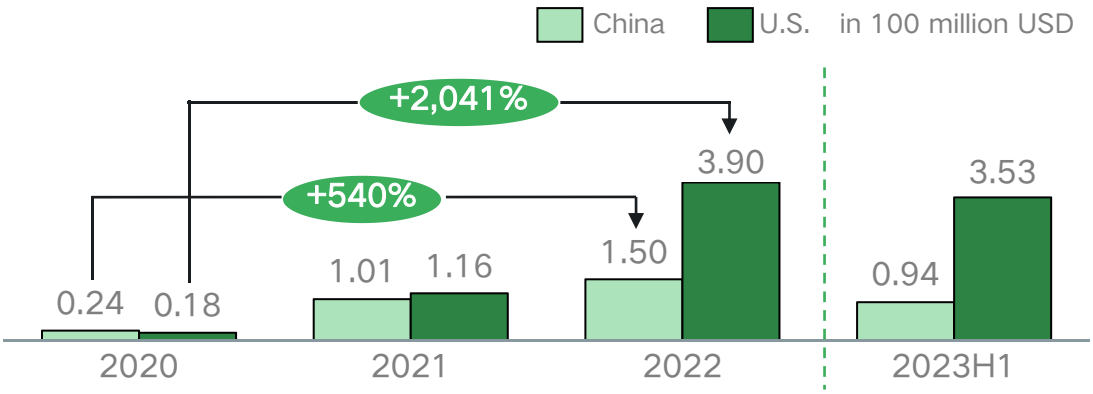
The global market takes precedence over all other markets. Thus, it is imperative for Chinese pharmaceutical companies to proactively explore the overseas market in order to make a name for themselves in the world.



Source: Research and analysis by Pharmcube; company annual reports; desk research materials.

Sales of BeiGene's Zanubrutinib in recent years

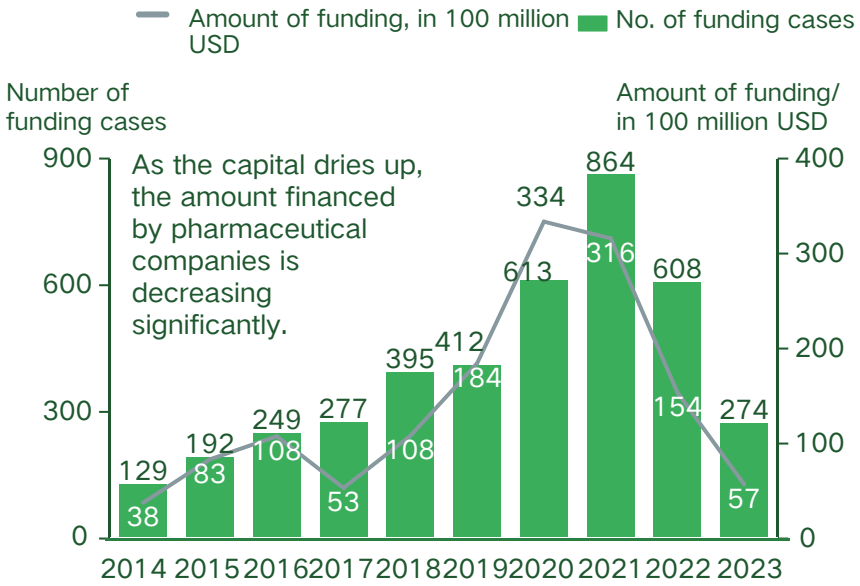
The overseas market has become the main source of sales for zanubrutinib, with a significantly higher growth rate than the Chinese market.



Funding has become increasingly tough in recent years, so most pharmaceutical companies are looking to improve cash flow and secure funding through transactions and collaborations.

Funding in Chinese market in the past decade

In 2020, the pharmaceutical industry began to experience funding challenge. Chinese companies found it increasingly difficult to financing and maintain healthy cash flow.



Source: Research and analysis by Pharmcube; NextPharma database; MedAlpha database; data as of August 15, 2023.

Upfront payments received by Chinese pharmaceutical companies in 2020[1] to 2022

These transactions have brought some cash flow to Chinese companies.

0.25~650 mUSD
Amount of upfront payment

1%~68%
Proportion of upfront payment

To some extent, transactions have assisted the lincensors in securing additional funding.

In certain transactions, the licensee has made investments before or after the transaction (non-exhaustive list).

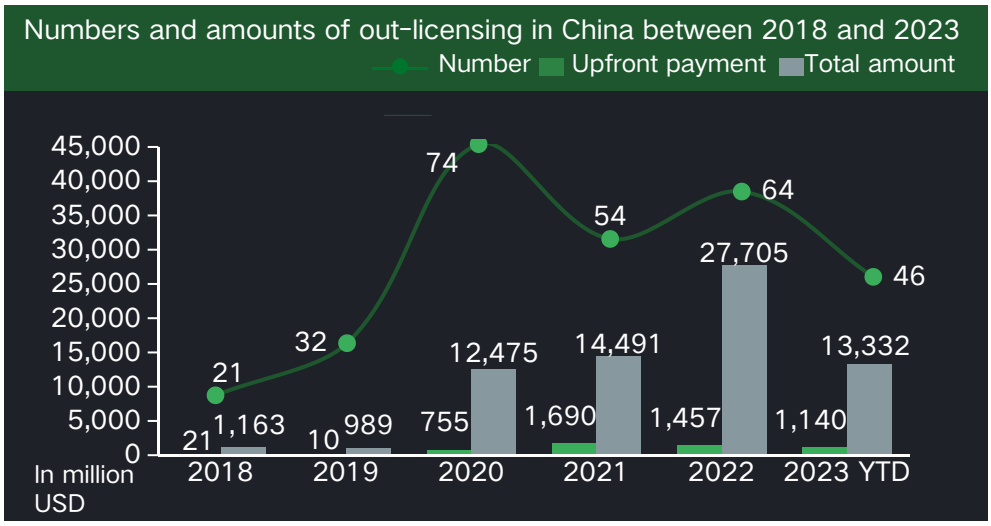
Transaction date	Licensor	Licensee	Investment
Dec 10, 2021	Regor Therapeutics	Eli Lilly	In June 2021, Lilly Asian Ventures led the series B financing in Regor Therapeutics.
June 1, 2022	DAC Biotechnology	Johnson & Johnson	In June 2022, Johnson & Johnson Innovation led a strategic investment in DAC Biotechnology.

Successful transactions enhance the confidence of other investors.

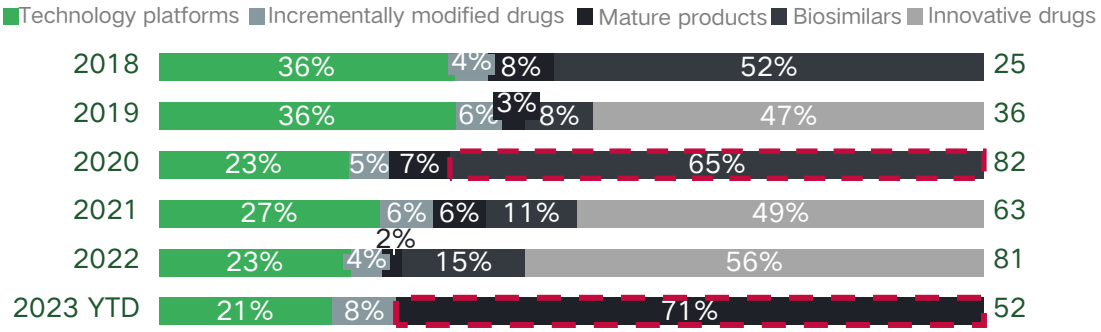
PART TWO

Scenarios and Data of Chinese Pharmaceutical Companies Going Overseas

Innovative drugs are the main driver of out-licensing growth in terms of both number and value. China experienced its first surge in out-licensing of Chinese innovative drug products in 2020, resulting in a noteworthy increase in both transaction volume and transaction value.



Types and percentages of out-licensing in China between 2018 and 2023

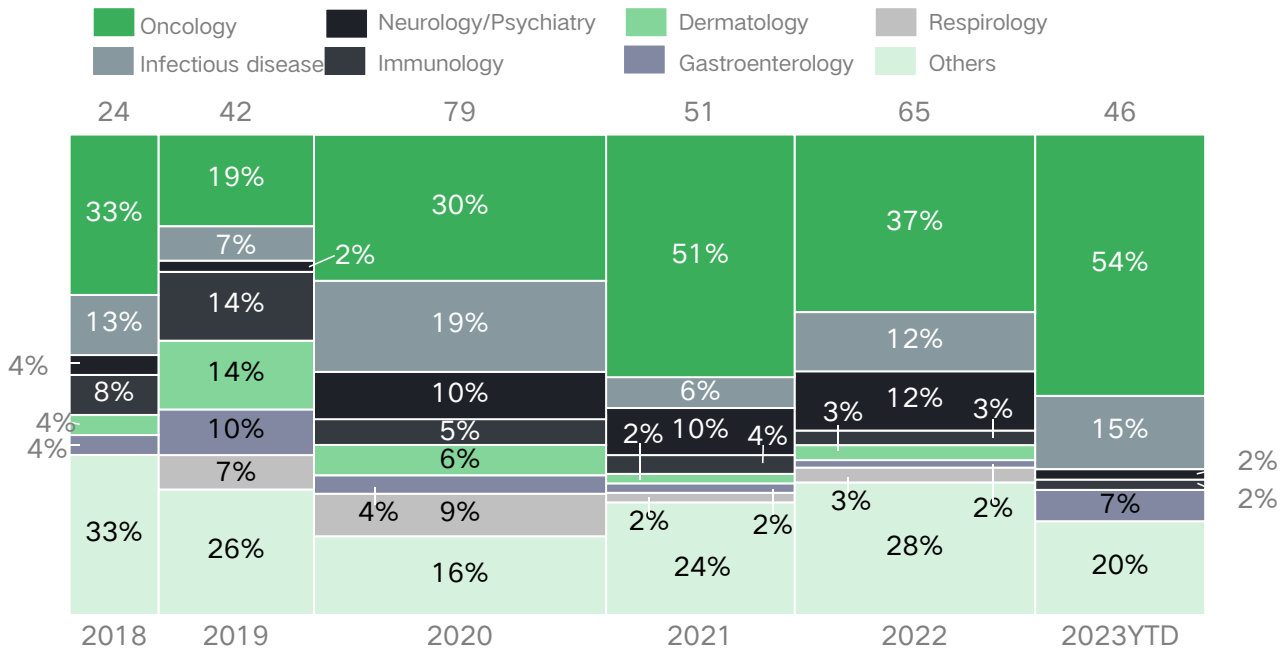


Note: One transaction may contain one or more projects.
Data as of July 14, 2023.

Source: Research and analysis by Pharmcube; NextBioharm™ database.

Oncology remains the top field with transaction numbers in 2023 year-to-date having already matched those of the previous years. Regarding drugs technology, the main drivers of out-licensing in China are small molecules and monoclonal antibodies, which are relatively mature.

Indication distribution of out-licensing drugs in China

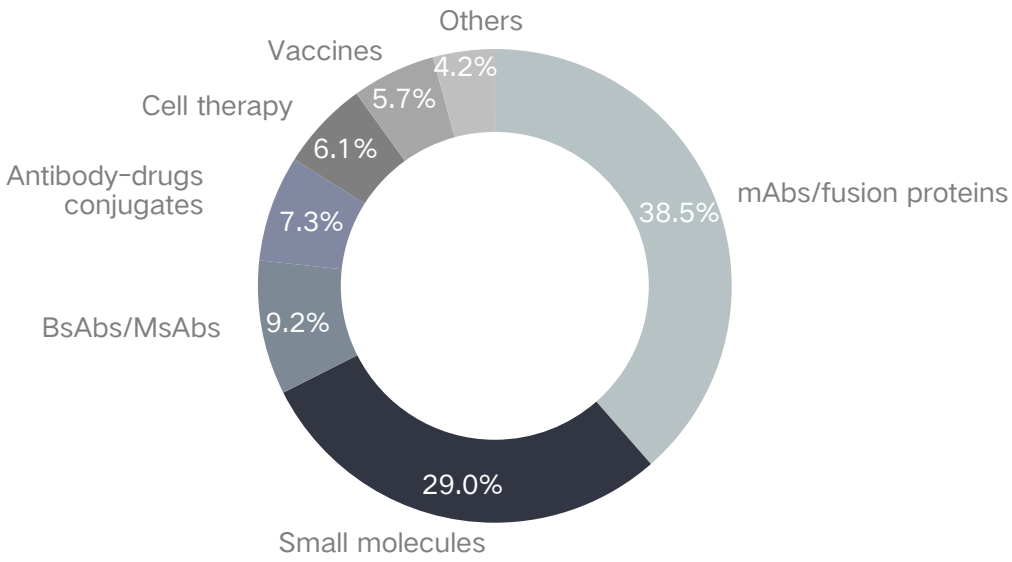


Note: Exclusions apply to leukemia in the context of blood diseases, and duplicate drugs entries are possible across disease categories. drugs and technological platforms that fail to specify relevant disease areas are not included.

Data as of July 14, 2023.

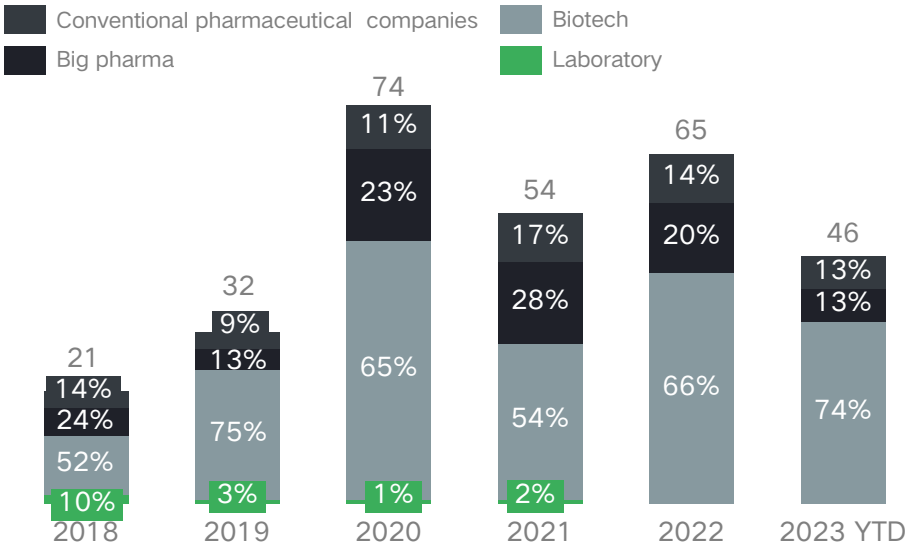
Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Percentages of different drugs types for out-licensing in China



Conventional Chinese pharmaceutical companies focus on the domestic market with insufficient international layout, while biopharma and biotech companies in China are actively persuing out-licensing transactions. In addition, biopharma entities have more stable cash flows, and the stages of out-licensing drugs are gradually moving backward.

Types of Chinese companies engaged in out-licensing between 2018 and 2023

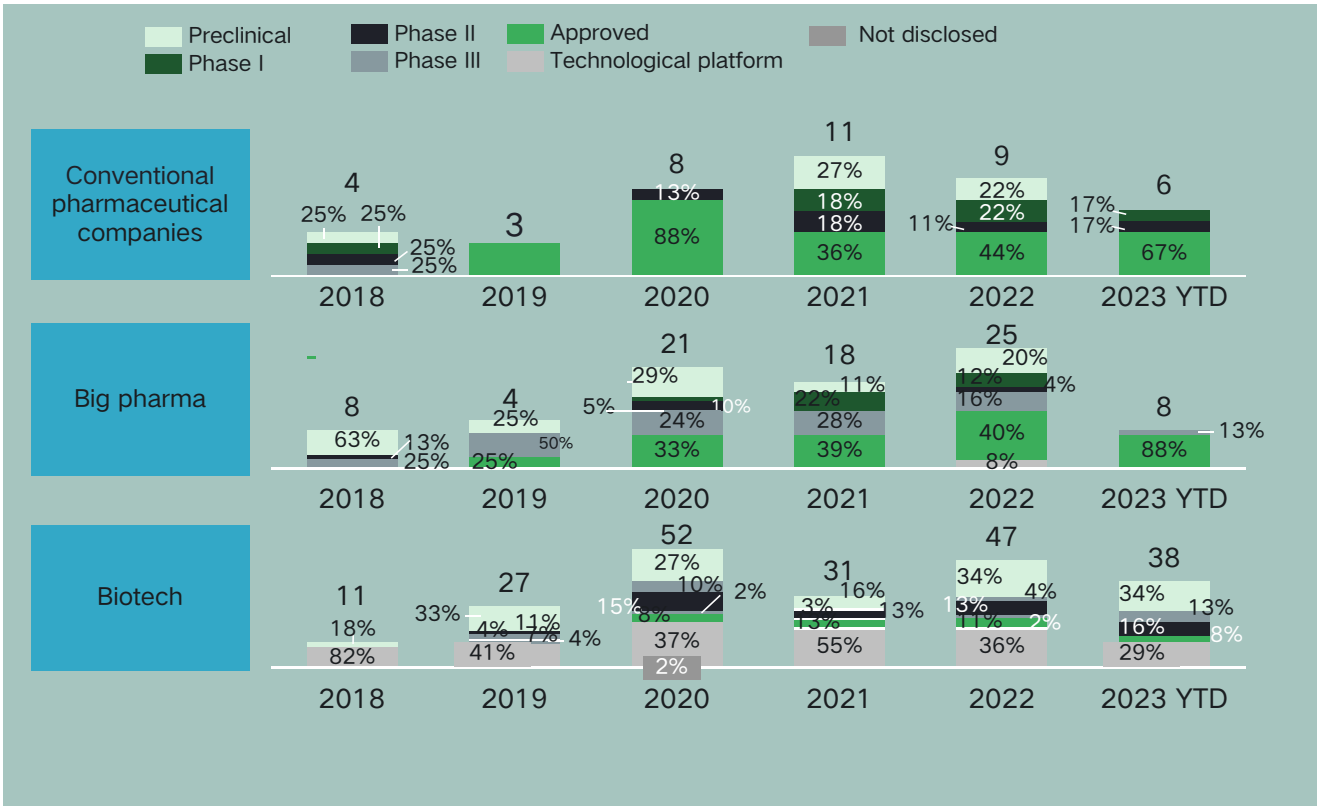


Note: The types of licensor are based on the number of transactions. The types of projects are based on the number of projects. A single transaction may consist of one or more projects. In cases where a transaction involves multiple licensors, all licensors are counted. Out-licensing projects exclude those transactions where universities or hospitals act as the licensors.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

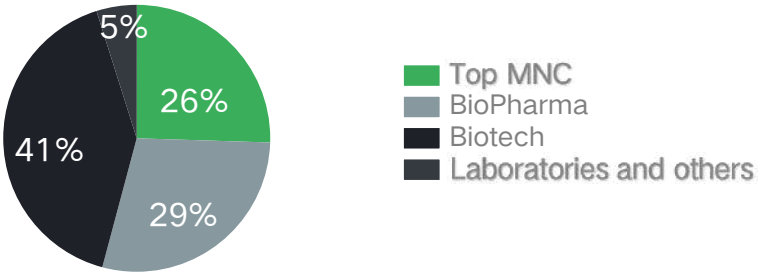
	Time of establishment	Independent commercialized products
Conventional pharmaceutical companies	before 2000	√
Biopharma	after 2000	√
Biotech	after 2000	×

Clinical stages of projects and drugs involved in out-licensing between 2018 and 2023



Currently, Chinese pharmaceutical companies primarily license out their products to biotechs for collaboration. Foreign biotech companies and top multinational corporations (MNCs) engage more in transactions involving early-stage products, while internatinal biopharma companies tend to focus more on late-stage clinical products.

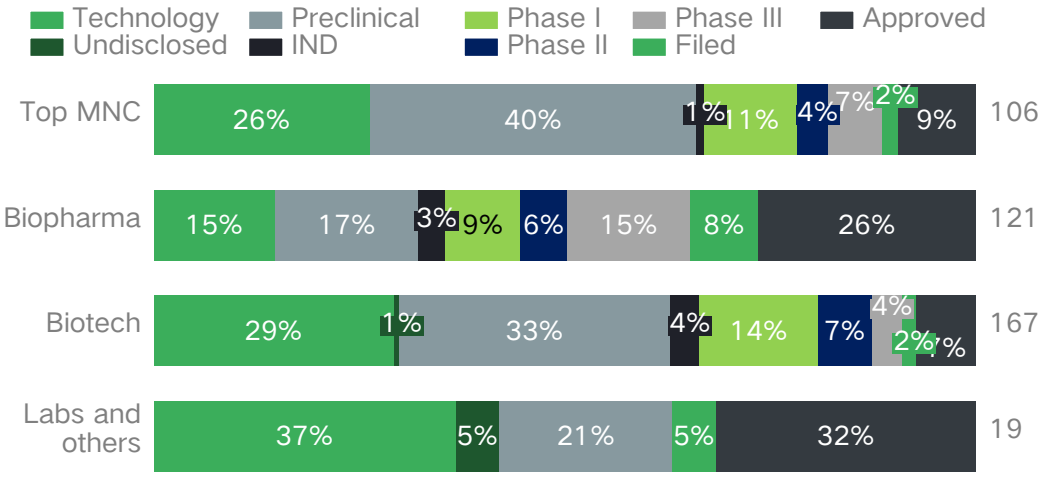
Licensees of out-licensing products in China from 2018 to 2023



Top MNC: Companies with over 20 products that have received market approval.

Biopharma: Companies with some products that have received market approval or capable of cross-country commercialization in certain regions, e.g. in South America or Southeast Asia, or those with no product that has received market approval but are capable of cross-country sales in certain regions.

Biotech: Companies without approved products or only with 1-2 products on the market, which have relatively weak commercialization capabilities.

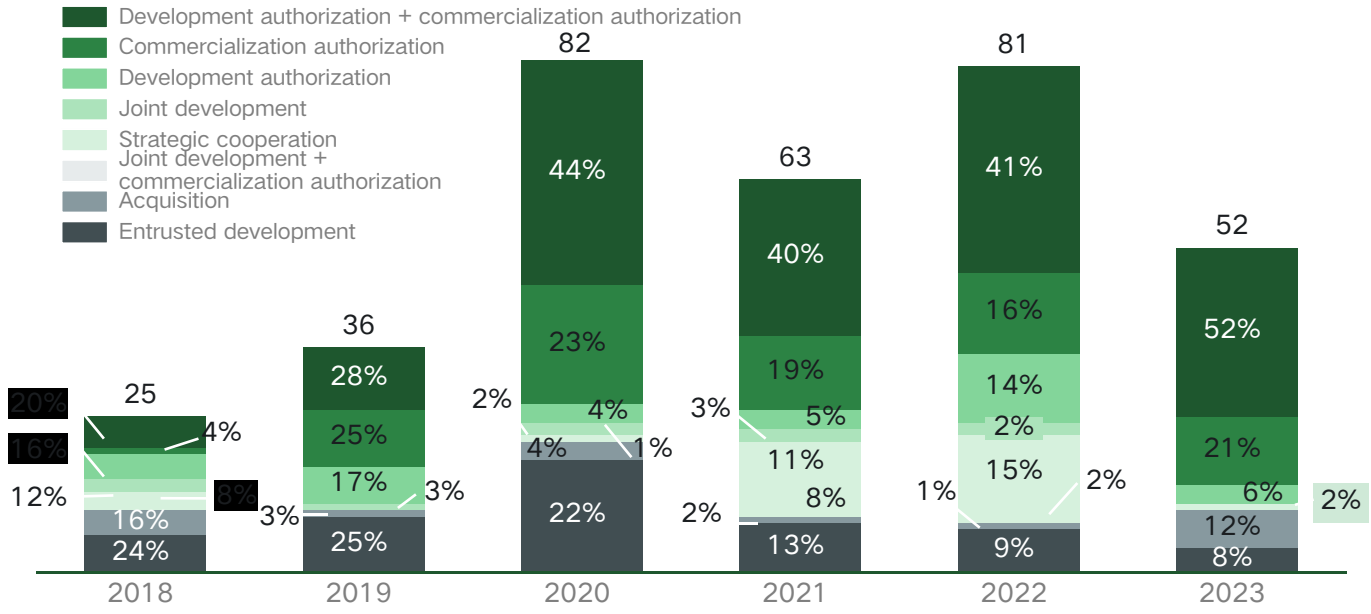


Note: The types of licensees are based on the number of transactions. The phases of clinical trials are based on the number of projects. A single transaction may consist of one or more projects. Data as of July 14, 2023.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Product development and commercialization authorization are the primary approaches in out-licensing. Additional terms such as options, investments, and joint ventures are increasingly included in transactions. The cooperation in out-licensing and authorization is becoming more diverse.

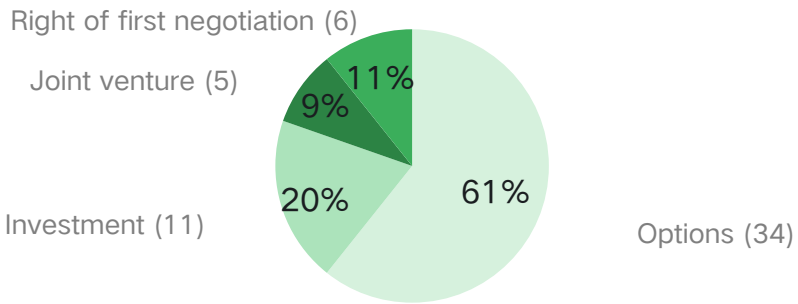
Approaches in out-licensing projects between 2018 and 2023



Note: Transactions where pharmaceutical companies or universities act as the licensor are included and calculated based on the number of projects. Development authorization include those authorization given to early-stage R&D and clinical trials. Joint development refers to both parties sharing R&D expenditure and profits. Strategic cooperation refers to transactions with undisclosed rights and interests.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Additional terms in agreements for out-licensing drugs (2008 to 2023 YTD)



Investment: The licensee invests in the licensor.

Options: The licensee has the choice of acquiring the approved product or expanding its interests.

Joint venture: The licensee and the licensor collaborate on drugs development by establishing a joint venture.

Right of first negotiation: The licensee has the right of first negotiation for the product under cooperation.

01

Independence VS partnership: why companies choose different approaches

- BeiGene
- Legend Biotech

02

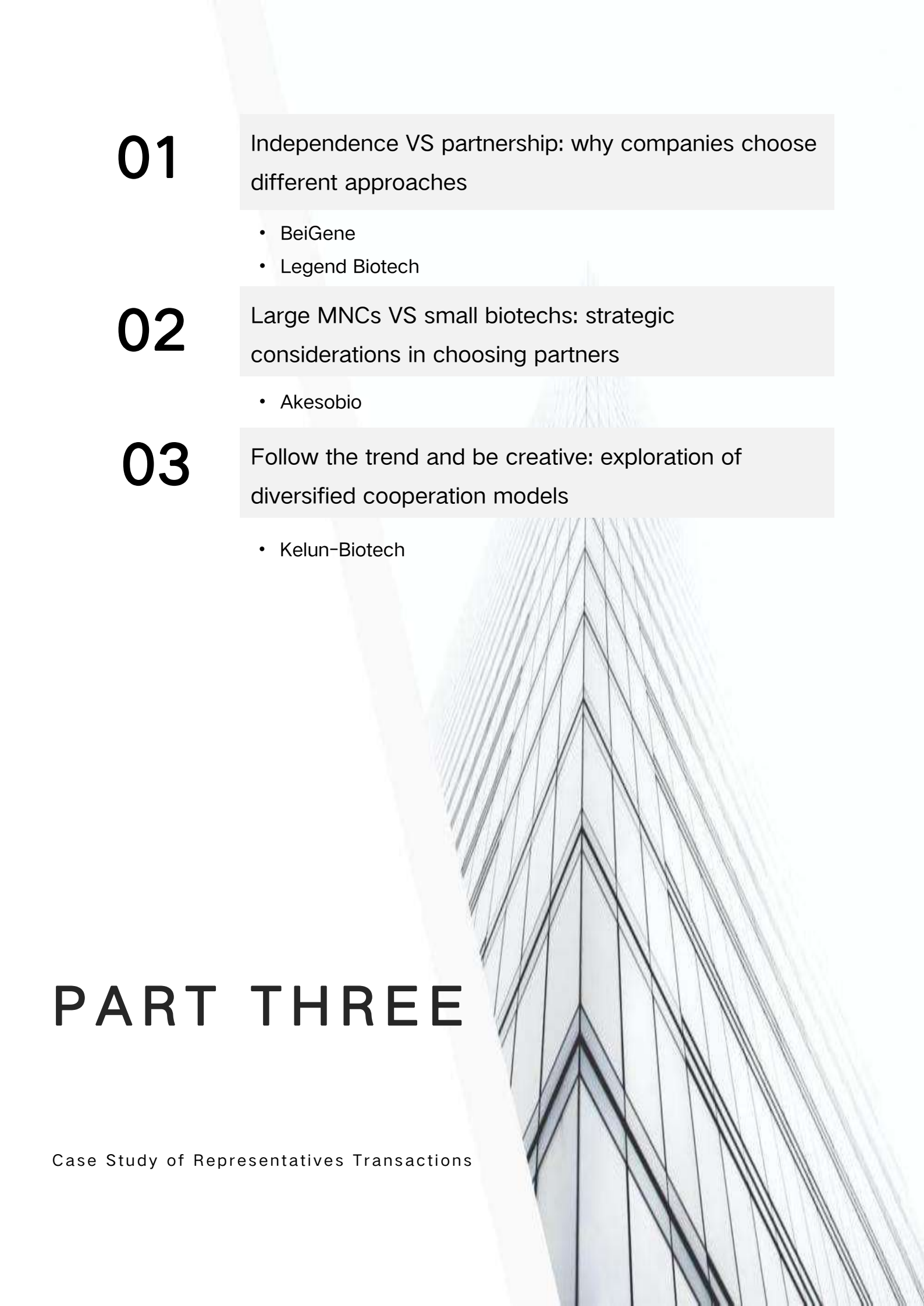
Large MNCs VS small biotechs: strategic considerations in choosing partners

- Akesobio

03

Follow the trend and be creative: exploration of diversified cooperation models

- Kelun-Biotech



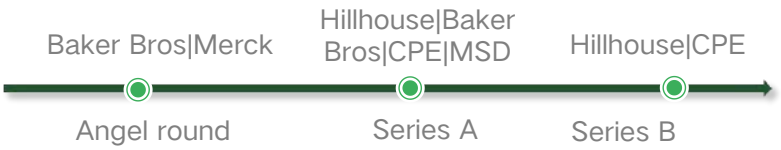
PART THREE

Case Study of Representatives Transactions

With their global vision, product strength and abundant capital, BeiGene has chosen to go global independently.

Throughout its development, BeiGene has consistently received global funding support and has upheld a global vision. The company has adopted a core strategy of globalized operation since its inception.

BeiGene's funding records



Top shareholders

Shareholder	Percentage
Amgen	18.07%
Baker Bros	11.19%
HHLR fund	10.79%

Zanubrutinib possesses a distinct advantage and shows greater potential. Additionally, in comparison to solid tumors, the market for hematologic malignancies is more centralized, thereby providing greater opportunities for independent commercialization of zanubrutinib.

Zanubrutinib possesses a distinct advantage and shows greater potential.

- Mantle cell lymphoma (MCL) is an aggressive, rare form of B-cell non-Hodgkin lymphoma (NHL) that lacks effective new treatments. There is a significant unmet clinical need, making MCL an ideal primary indication for approval.
- Zanubrutinib is designed with differentiation and demonstrates significant clinical potential. Later head-to-head studies have shown its efficacy in chronic lymphocytic leukemia (CLL) /small lymphocytic lymphoma (SLL) to be superior to that of Ibrutinib.

The hematologic malignancies market is more centralized, making it easier to establish an internal commercialization team.

Xiaobin Wu
BeiGene President

Market share of top 800-900 hospitals

"...Hematological malignancies have a relatively high market concentration both domestically and internationally. Therefore, our team did not initially need to be exceptionally large. A team of 300 people in the United States would be sufficient to cover all key doctors and clinical centers..." -Xiaobin Wu

As the first pharmaceutical company in the world being listed on NASDAQ, Hong Kong Stock Exchange, and Shanghai Stock Exchange, BeiGene has abundant financial resources.

BeiGene has accumulated a total financing amount of USD 7.947 billion

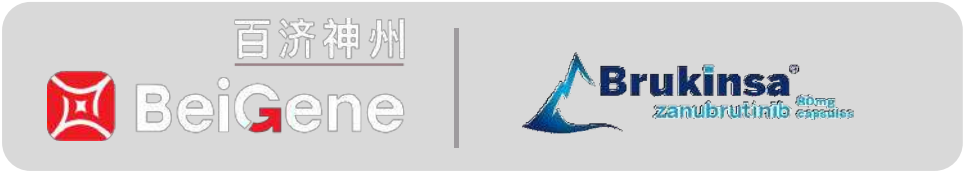
Date	Funding round	Funding amount
2016.02	NASDAQ IPO	USD 158 million
2018.08	Hong Kong IPO	HKD 7.085 billion
2021.12	Shanghai IPO	RMB 22.16 billion

Sales in more than 45 countries and regions worldwide, including the U.S., EU, Japan, and Australia

The overseas commercialization team already has more than 300 members in the U.S. alone

Fourteen MRCT trials have been conducted for Zanubrutinib

Zanubrutinib's overseas journey



2015.03	Had a pre-IND consultation meeting to discuss IND application materials.
2016.05	Discussed phase I results and decided the approach for development and registration for treatment of MCL, and discussed the possibility of market approval with phase I+ II data.
2016.06	Zanubrutinib received the orphan drugs designation for treatment of MCL.
2017.04	Had a meeting to discuss development plans and continued to explore the possibility of market approval with phase I+II data.
2017.12	Had the chemistry manufacturing and control (CMC) meeting.
2018.08	Had the NDA meeting to discuss necessary materials for research and data required for FDA's accelerated approval.
2019.01	Zanubrutinib received FDA breakthrough therapy designation.
2019.02	Had a pre-phase III meeting to discuss the design and performance of certainty study on use of Zanubrutinib for treatment of MCL.
2019.05	Had a pre-NDA meeting.
2019.06	Submission of NDA application.
2019.11	Zanubrutinib received FDA market approval for treatment of MCL.
2020.06	Zanubrutinib received approval for treatment of CLL/SLL and subsequently approvals for Waldenström's macroglobulinemia (WM) and marginal zone lymphoma (MZL) in China, EU and the U.S..

Source: Research and analysis by Pharmcube; MedAlpha database; Desk research materials.

Legend Biotech had limited resources, thus difficulties, in independently exploring overseas markets. However, their excellent research data attracted Johnson & Johnson, leading to a successful collaboration and expansion into the international market.

Despite LCAR-B38M's excellent performance and differentiation, the expensive CAR-T therapy is difficult for Chinese patients to afford. The overseas market is destined to be the main battlefield for CAR-T therapy, however, Legend Biotech lacked the resources needed in terms of R&D, clinical trials, production, and commercialization.

Stunning efficacy data and the greatest potential in the class

The data announced at the 2017 ASCO annual meeting reported that 100% of 35 patients with relapsed or refractory multiple myeloma responded to CAR T-cell therapy, and 14 of 19 patients achieved a stringent complete response and other 5 demonstrated durable complete remission.

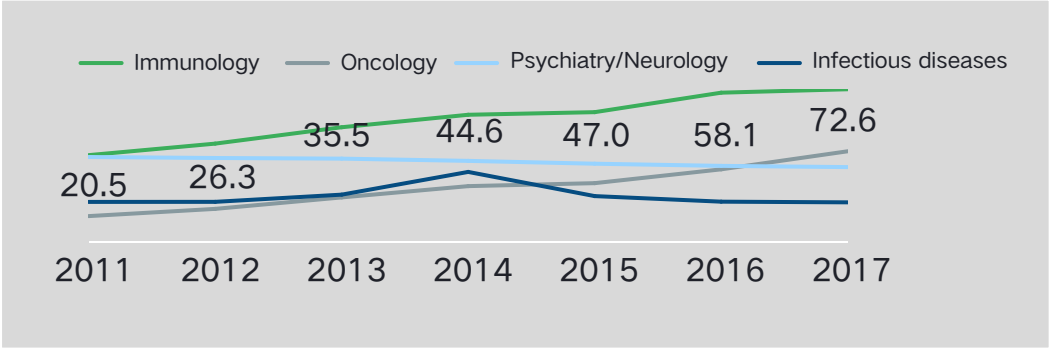
Incapable of overseas operation

No public funding

Johnson & Johnson began investing in the multiple myeloma (MM) market in 2003. By the time of their collaboration with Legend, Johnson & Johnson had already successfully launched two crucial products in the market and was advancing with various others. They possessed significant advantages in terms of clinical resources and commercialization.

Oncology has gradually become a pivotal business for Johnson & Johnson, with multiple myeloma (MM) being a key focus area where they have abundant resources and experience. Committed to transforming MM treatment, Johnson & Johnson was actively seeking new therapies to enrich their MM product pipeline.

Revenue of Johnson & Johnson's pharmaceutical business by indication (in billions of USD)

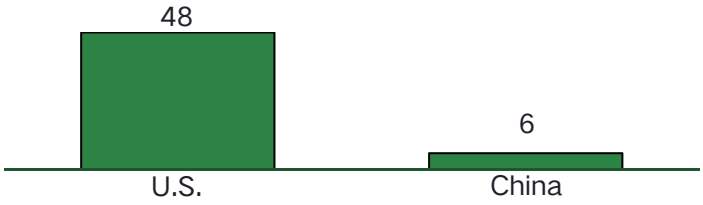


Johnson & Johnson's MM products in 2017

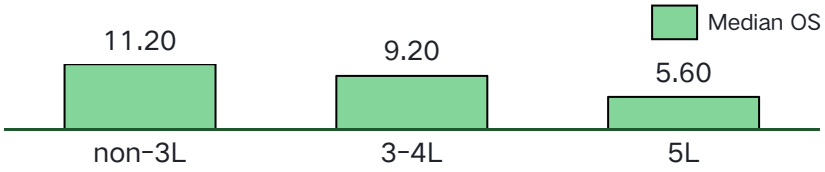
Product	Mechanism of action	Phase
bortezomib	proteasome inhibitor	Approved
daratumumab	CD38 monoclonal antibody	Approved
talquetamab	CD3 x GPRC5D bispecific antibody	Phase I
teclistamb	CD3 x BCMA bispecific antibody	Phase I

The incidence of MM in the U.S. is significantly higher than in China, and there lacks new treatments to improve survival for patients in the advanced stage - a significant unmet clinical need exists.

MM incidence in China and U.S. (per 100,000 people)



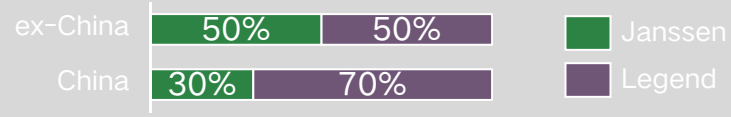
Median overall survival (OS) of patients with relapsed/refractory MM



Legend Biotech & Janssen Pharmaceutical Companies

Time: December 21, 2017
Subject: LCAR-B38M (BCMA-targeting CAR T cell therapy)
Content: Legend granted Janssen a worldwide license to jointly develop and commercialize LCAR-B38M
Amount: Upfront payment of USD 350 million, USD 1.7 billion in total

Cost-benefit sharing



➢ License-out journey

- **2015.10** LCAR-B38M Phase II clinical trial was completed.
- **2017.06** It made a a stunning appearance at the ASCO annual meeting, attracting Johnson & Johnson's attention.
- **2017.07** Johnson & Johnson's global team conducted a research visit to China.
- **2017.12** Legend and Johnson & Johnson entered a formal partnership.
- **2022.02** LCR-B38M (cilta-cel) received FDA market approval.
- **2023.02** According to Johnson & Johnson's annual report, cilta-cel achieved a global sales revenue of $134 million in 2022.

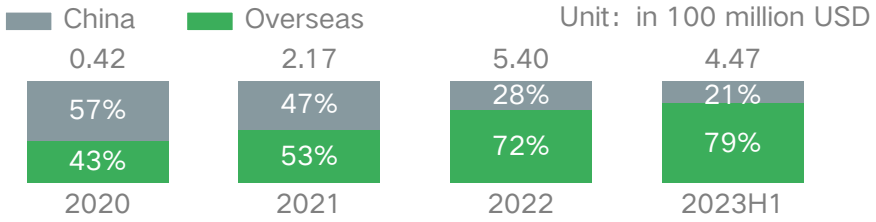
Independence or partnership: In order to maximize profits, the company has to make the right choice on the basis of their own situation and the general trend.

Both approaches achieved good results

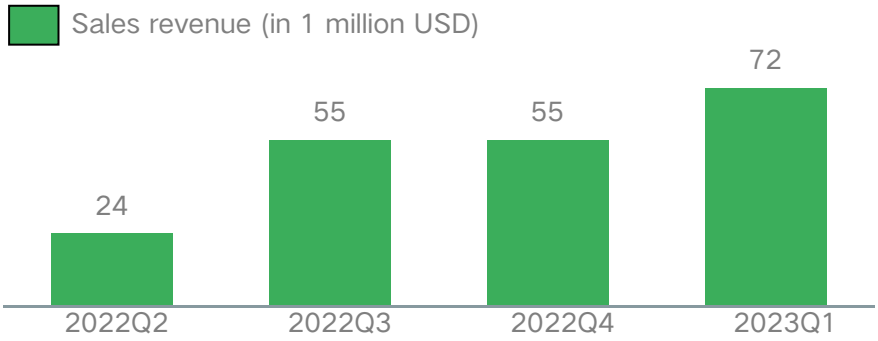
BeiGene's product performance (independent)

Legend Biotech's product performance (partnership)

Overseas market has become a main source of Zanubrutinib's revenue growth



With Johnson & Johnson's promotion, Cilta-cel realized its value in overseas market first and has brought in USD 103 million for Legend.



A company's global expansion can be achieved independently or through a partnership, with the decision dependent on a thorough analysis of the company's current position and objectives.

Product

Independence

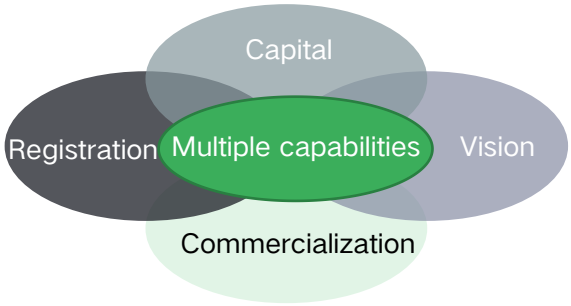
Partnership

Differentiated, innovative, and high-quality products are the starting point of international journey.

Targets	Data	Indications
FIC, BIC/leading products are the best choice	• Carrying out trials in compliance with international standards to improve data credibility • Able to compete with global products	Address unmet clinical demands and potential market opportunities

- A company needs stronger capabilities to independently tap the overseas market.
- Business development capabilities are at the core for overseas partnership.

Capability



- Select the right partner
- Identify the best timing
- Negotiation ability
- Have a broad contact network

- It is more demanding to go global independently. Although there are greater challenges, to be an international pharmaceutical company is necessary. For companies that have the necessary resources, going global independently helps to further develop their capabilities and strengths.
- Partnership offers more flexibility. By choosing this approach, the Chinese company can use the foreign partner's resources to drive product R&D and value realization. For companies that lack resources or for projects that are more suitable for out-licensing, partnership is an appropriate strategy.

Akesobio chose a partner that best suited their situation. They out-licensed their lead product to Summit and pioneered the unique approach of working with a biotech company.

The main objective for Akesobio's business development team is to get ivonescimab approved for overseas markets as soon as possible. Therefore, their main concern is how to improve the international capability of the whole team and system. Partnering with a biotech company and the unique resources provided by Summit met Akesobio's needs just perfectly.

During transactions, MNCs usually have more power and control, which does not necessarily benefit the innovative company in terms of gaining value beyond the transaction itself. However, Summit possesses not only a team of experts but also a welcoming and inclusive attitude.

MNCs tend to have large R&D pipelines. It can be difficult to tell how much priority or resources they will give to developing the product after the transaction. For Summit, as an emerging biotech company, it has only one phase III product (which is not doing very well according to development results) and all the others are preclinical products. It desperately needs a lead product to keep the company running, so it would definitely be all in to promote ivonescimab.

In average, top MNCs have 273 pipeline products

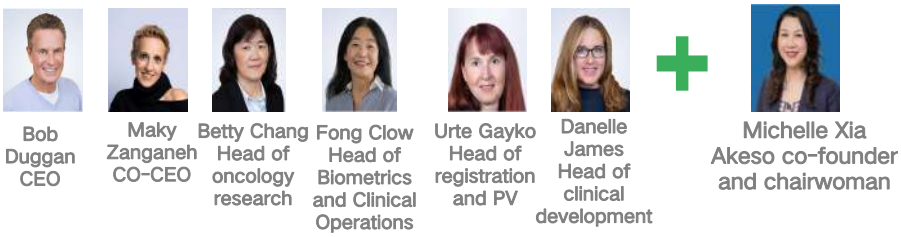
Average pipelines: 273
between 195 and 321 in general

Failed transactions in recent years tend to involve MNCs

Date	Licensee	Licensor	Product
2023.07	Novartis	BeiGene	ociperlimab
2023.07	AbbVie	Jacobio	SHP2 inhibitor
2020.12	Eli Lilly	Innovent	Sintilimab
2020.10	Eli Lilly	Fosun Pharma	FCN-338

An experienced global team: innovators behind ivonescimab

Dr. Michelle Yu was appointed as a member of Summit's board of directors to enhance cooperation



World-class team + in-depth cooperation helps Akesobio to enhance its internationalization capability and ensures the development of ivonescimab.

"...When a biotech company out-licenses a product to a large, multinational pharmaceutical company, it may only receive a financial return and a boost to its reputation. Beyond this, it has little control, including over payment schedules. A small yet fantastic partner such as Summit aligns better with our initial business development goals..." - Michelle Xia

Transaction info

Time: December 6, 2022

Subject: ivonescimab (PD-1/VEGF)

Product phase when transaction: Phase III

Content: Akeso out-licensed to Summit rights to ivonescimab for development and commercialization in the United States, Canada, Europe, and Japan.

Amount: Upfront USD 500 million, USD 5 billion in total

Unique features

1. Licensed a lead product to a biotech company
2. Funding and equity transaction took place at the same time. Akeso founder Dr. Michelle Yu was appointed to the board of directors of Summit.
3. The total deal amount hit a new record.

1 Product promotion and development

2 Low demand for endorsement

3 Cash flow demands

Akeso Summit

Source: Research and analysis by Pharmcube; NextBiopharm™ database; Desk research materials.

Demand for endorsement and cash flow were also driving forces behind Akesobio's decision to collaborate with Summit. Based on the market response and the development of ivonescimab, their collaboration has been successful.

One reason why many Chinese biotech companies opt for MNC partnerships is for the endorsement and subsequent funding. However, Akesobio has little need for endorsement because it has a successful product that speaks for its own strength, and the company is already listed and generating revenue.

Akesobio possesses multiple R&D pipeline products. At the time of the transaction, there was a requirement for stronger cash flow to develop the pipeline products and advance the clinical projects. The good thing was that Summit agreed to pay higher upfront payment.

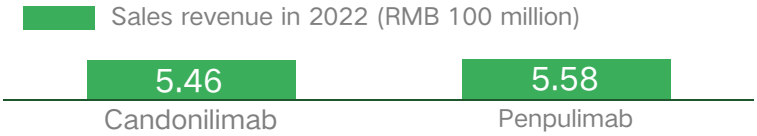
MNCs transaction + products on the market ➡ highly recognized company strength

	Time	Product	Partner	Type
Transaction	2015.12	quavonlimab	Merck & Co.	Out-license
	2019.06	Penpulimab	Chiatai Tianqing	Cooperation

	Product	Mechanism of action	Approved on
Approved products	Cadonilimab	CTLA4/PD1 bispecific antibody	2022/06/29
	Penpulimab	PD1 monoclonal antibody	2021/08/03

Listed + cash flow ➡ low demand for capital

- The company was listed in Hong Kong on April 24, 2020 and raised USD 2,968 million
- Two commercial products brought in massive revenues



Akesobio's pipeline products demand capital

According to Akesobio's annual report, in 2023:

- 4 new drugs await market approval
- 4 pipelines await registration for phase III clinical study
- 5 pipelines await 1b/II clinical study
- 3 pipelines await entering clinical phase

Late-stage products need value realization

At the time of the transaction, ivonescimab had reached phase III trials, necessitating a substantial amount of funding to realize the product's worth and recover its costs.

Summit lacked the commercialization capability at the time, so ivonescimab was more likely to be sold to other multinationals. As a safety precaution, Akeso required a higher upfront payment.

Bob Duggan is a prominent figure in the venture investment industry, renowned for his exceptional operational skills.

Outcome of Akesobio's partnership with biotech

On the day after the transaction, Akesobio's stock opened up by almost 40% and closed with an uptick of 18.78%.

Overseas progress has continued with a multicentre clinical trial for ivonescimab to treat NSCLC conducted in August intending to recruit 400 patients worldwide.

On January 26, 2023, Akesobio received the upfront payment of USD 300 million.

Source: Research and analysis by Pharmcube; NextBiopharm™ database; Company annual reports.

Akesobio

Akeso

Summit therapeutics

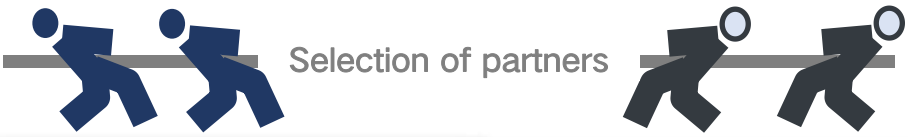
Summit

Partner selection should be grounded in business development objectives, with highly aligned and complementary interests as the primary consideration.

Pros and cons of different partner types

The key is that the partner should suit the company's own demands

Large MNCs	Small biotechs
· Increase the company's and product's market awareness, serving as an endorsement · Provide higher transaction amount · Add advanced expertise in drugs R&D and commercialization, benefiting future progress	• Prioritize the development of licensed pipelines • Focus on R&D and less likely to transfer the product to others due to changes in business focus or prioritization of pipelines



- Large MNCs have more pipelines and products in development, which may result in insufficient attention being given to the licensed product.
- MNCs hold more power in the transaction, leaving the Chinese company with less room to negotiate.

- Biotech companies lack commercialization experience, which could impede the product's market performance.

Considerations of the out-licensing company in selecting partners

Highly aligned and complementary interests are the primary considerations

Considerations		Factors	Explanation
Driving factors	Clear BD goals	Endorsement Cash flow Promote R&D Product commercialization	➡ Large MNCs ➡ Companies that can provide large amount upfront payment ➡ Companies that have advantages in technological platform and clinical resources ➡ MNCs that have strong sales capability in relevant areas
	Clear partnership strategy	Enhance Complement Expand	Understand the partner's strategic investment and goals in the relevant disease and select the right partner to avoid the product being transferred to others in the future.
Company advantages	Know its own product's situation	Target/mechanism Technological advantages Competition Patient/market	Knowing the product's advantages and position helps to narrow down potential partners and transaction amount range, e.g., MNCs prefer early-stage innovative products.
	Know the partner's advantages	R&D Capital Registration Commercialization	Knowing the partner's advantages help to align with the company’s own business development goals.
Others	Other factors	Culture alignment Mutual trust Prioritization	Alignment in corporate culture and exchanges, mutual trust, and the partner's prioritization of the product all play a role in the company's decision-making.

MSD received licenses from Kelun-Biotech for several pipelines and subsequently became its second-largest shareholder. The two companies established in-depth collaboration through consecutive licenses and equity transactions.

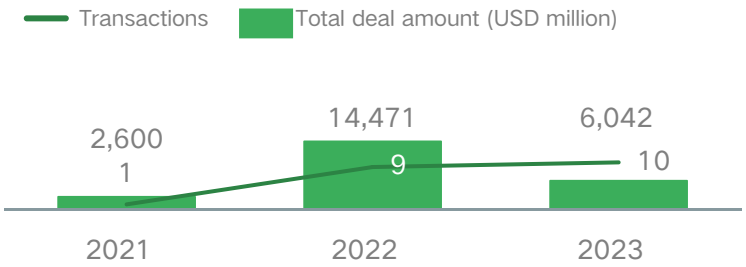
Focusing on ADCs, Kelun-Biotech is one of the first biopharmaceutical companies in China, and one of the few globally, to establish an integrated ADC development platform.

- Comprehensive and integrated ADC platform
- Protected by over 40 patents worldwide
- Next generation linker-payload technology
- Collaboration with small molecule and large molecule platforms

Four pipelines are under clinical trial

Given their unique advantages, ADCs are widely recognized as the next-generation solution for tumors. MSD has been proactively scouting for fresh ADCs to enrich its existing pipeline and expand the lifecycle covered by Keytruda.

ADC out-licensing in China



Combined administration potential between ADC products and Keytruda could extend the usage of ADCs from just end-stage patients to frontline or even earlier-stage individuals.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.
*Data as of July, 2023.

While Kelun-Biotech received a smaller upfront payment, it profited from the substantial total transaction sum and MSD's endorsement. This resulted in an elevated market valuation and a successful listing on the Hong Kong stock market.

MERCK

Series B financing

MSD and several other investors provided USD 200 million to Kelun-Biotech, which was valued at USD 1.48 billion.

2022.12.29

Kelun-Biotech was successfully listed in July.

2023.07.11

KELUN-BIOTECH 科伦博泰

Kelun-Biotech

MERCK

MSD

Transaction info

MSD and Kelun Biotech have made three deals totaling USD 11.821 billion.

2022-05-16	2022-07-26	2022-12-22
Subject: SKB264 **Mechanism:** Trop2 ADC **Stage:** Phase III **Area:** Excluding Greater China **Upfront:** USD 47 million **Total:** USD 1.41 billion	**Subject:** SKB315 **Mechanism:** CLDN18.2 ADC **Stage:** Phase I **Area:** Excluding Greater China **Upfront:** USD 35 million **Total:** USD 936 million	**Subject:** 7 ADCs **Mechanism:** XX ADC **Stage:** Preclinical **Area:** Excluding Greater China **Upfront:** USD 175 million **Total:** USD 9.475 billion

Unique features

1 Several transactions for multiple ADC products from the same company

1 MSD participated in Kelun-Biotech's Series B funding, becoming its second largest shareholder with 6.95% stake.

Source: NextBiopharm™ database; Desktop research materials; Research and analysis by Pharmcube.

Transactions among pharmaceutical companies are becoming more commonplace and less traditional in terms of product selling and buying. Instead, companies are actively pursuing diverse and innovative models that align better with each other's interests.

The pharmaceutical industry in China is progressively maturing, accompanied by significant changes in the way companies conduct transactions.

Transactions are becoming commonplace

Companies are more willing to cooperate

Transaction parties enjoy greater equality

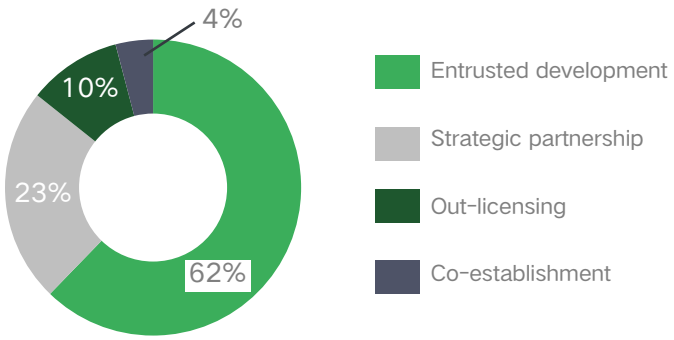
Approaches to transaction and cooperation are increasingly innovative

- Nowadays, the cooperation between pharmaceutical companies has evolved beyond simple transfers and licensing. Instead, companies are actively seeking innovative approaches for deeper, longer-term partnerships. Since 2019, additional terms such as equity transactions, investments, and joint ventures have become integral parts of these collaborative endeavors.

	Partner	Equity transactions
Kelun-Biotech	MSD	MSD injected a USD 100 million investment into Kelun-Biotech, becoming its second largest shareholder with a 6.95% stake.
Akesobio	Summit	The upfront contained USD 25.1 million in the form of Summit’s shares and Michelle Xia was appointed into the board of directors of Summit.
Innovent	Sanofi	After the completion of two transaction on pipeline products, Sanofi invested Euro 300 million in Innovent through subscription of new common shares.

Models of transaction and cooperation are increasingly diversified

- For instance, in the out-licensing of technologies, pharmaceutical companies have developed a variety of cooperation models based on their specific needs.



Type	Technology area	Representative companies
Entrusted development	Antibody technology	
	drugs discovery	
Out-licensing	Antibody technology	
Strategic partnership	Circular RNA	
	Gene therapy	
Co-establishment	drugs discovery	

Advice for pharmaceutical companies cooperating in the new trend

Pharmaceutical companies now have greater freedom in choosing cooperation models. It is crucial for them to foster an open mind and actively embrace innovative approaches that align with their development goals and complement the strategies of their partners.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

PART FOUR

Application Of Data In Screening
Overseas Opportunities

Based on existing achievements + following cutting-edge technologies, Pharmcube empowers enterprises with innovative solutions for drugs development across four strategic areas.

Target tracking and discovery

Our three-in-one artificial intelligence (AI) + human intelligence (HI) system monitors and tracks over 22,000* targets to deliver a complete drugs-target-disease spectrum.

Exploration of new technologies

We monitor and analyze global landscape of biological technologies development by following investments, transactions, and academic publications.

Clinical/medical strategies

We help pharmaceutical companies achieve acceleration and differentiation at the clinical stage by facilitating the deployment of indications, PIs, and locations.

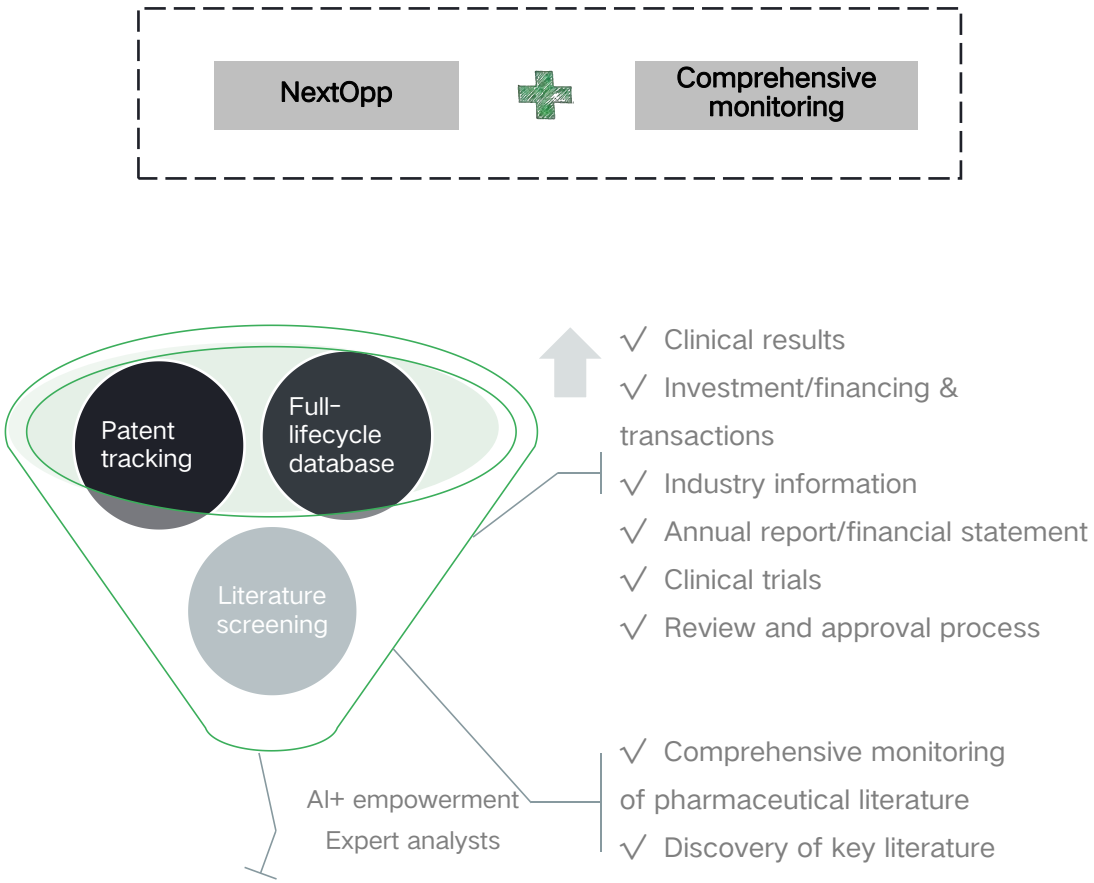
Market information

We help enterprises assess market potential, gain insights on market trends, and customize optimal strategies.

Note: The data consists of human genes and proteins confirmed following the completion of the Human Genome Project (HGP), along with partial non-protein targets, non-human targets, and other targets.

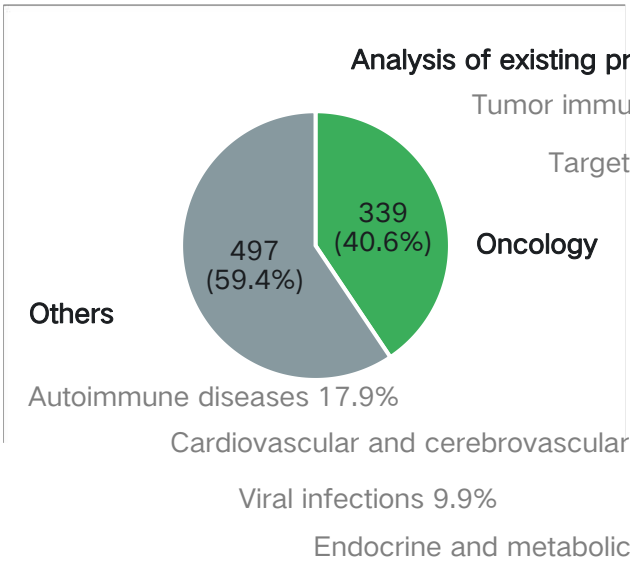
The three-in-one AI + HI monitoring system uncovers new market positioning opportunities by tracking industry breakthroughs, mapping the competition landscape in drugs R&D, and constructing a comprehensive knowledge map.

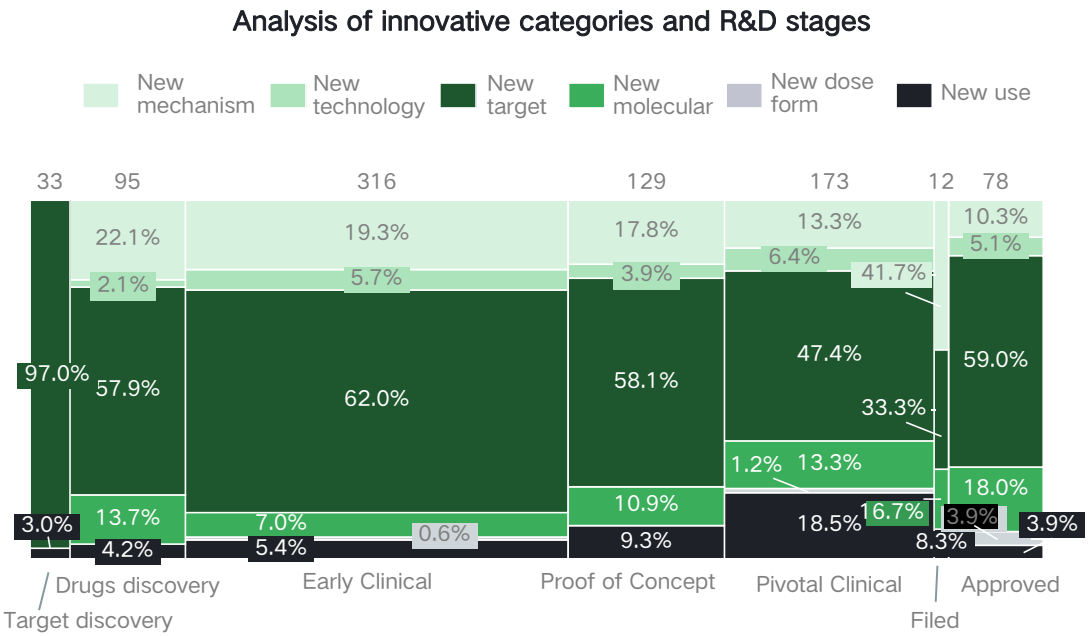
Latest industry information

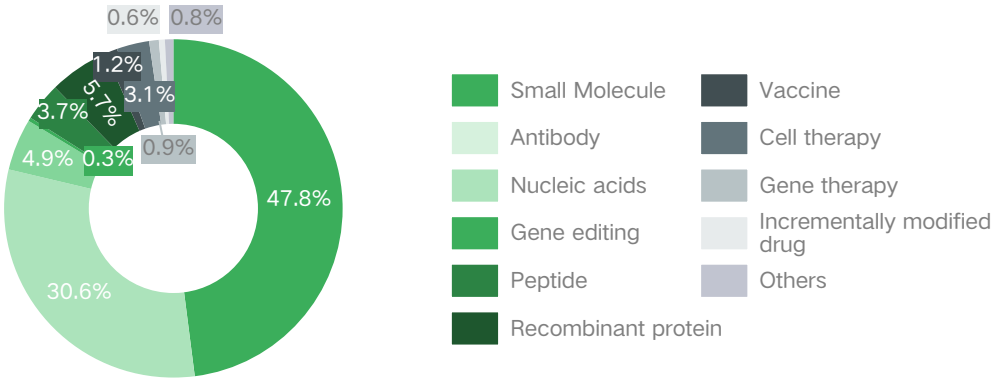


Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Pharmcube's new opportunity identification model monitors more than 800 projects spanning oncology and many other areas.







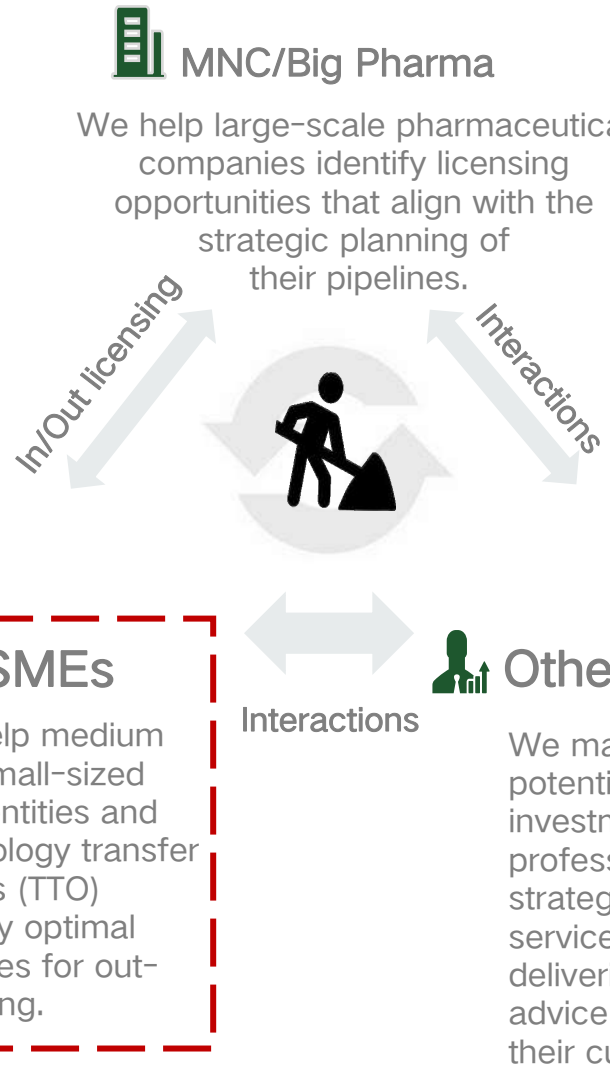
Note: Data as of July, 2023.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

The NextBiopharm™ database encompasses a catalogue of over 60,000 pipeline products. It leverages exclusive information sourced from firsthand researches to empower companies to pinpoint viable licensing opportunities.

Analysis of collaboration opportunities

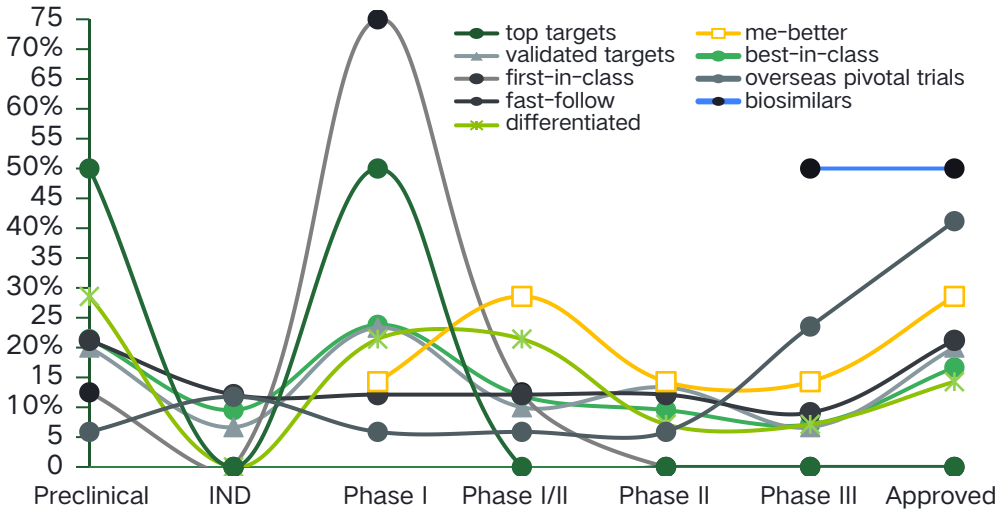
1. The platform provides clients with tracking and real-time update of comprehensive information regarding pipeline products that have potential for licensing.
2. Clients are able to add their own transaction information.



Source: Research and analysis by Pharmcube; NextBiopharm™ database.

The logic of screening prospective out-licensing opportunities

1	Target: Innovativeness/novelty, differentiation, R&D phase, competitive landscape, registrational clinical trials
1.1	Preclinical to Phase I projects: top targets, validated targets, differentiation
1.2	Preclinical to Phase II projects: Fast follow, me-better, best-in-class, a small number of first-in-class
1.3	Phase III to approval projects: Have overseas patents
1.4	Clinical results: Clinical trial results for drugs under research are good/superior/positive, etc
1.5	Competitive landscape: Exclude targets where more than four big pharmas have made moves



Chinese pharmaceutical companies' out-licensing programs between 2015 and 2023

Potential opportunities for Chinese pharmaceutical companies to go global

Opportunity	drugs product	R&D facility	Tag	Characteristic
anti-B7-H4 ADC	HS-20089	Hansoh Pharma	Top target, fast-follow	Leading in the Chinese market in terms of progress, second only to AZD8205 on a global basis
anti-BTLA mAb	tifcemalimab	Junshi Biosciences	Top target, validated target, first-in-class	On June 29, 2023, Junshi Biosciences announced that it plans to initiate a placebo-controlled, multi-regional phase III clinical study of tifcemalimab in combination with toripalimab as a consolidation therapy for patients with limited-stage small cell lung caner (LS-SCLC) without disease progression following chemoradiotheraphy. This is the first Phase III clinical trial for an anti-BTLA monoclonal antibody worldwide.
CDK2 inhibitor	ARTS-021	Allorion Therapeutics	Top target, fast-follow	Leading in the Chinese market in terms of progress, second only to PF-07104091 on a global basis
menin/MLL1 inhibitor	BN104	BioNova	Top target, fast-follow, differentiated	BN104 has shown superior efficacy in preclinical animal models for treatment of acute myeloid leukemia (AML), while having little inhibitory effects on hERG. It has low risk in corrected QT interval (QTc) prologation, therefore presenting greater safety. It has the fastest progress among researches that Chinese companieshave carried out for the same target.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Opportunity	drugs product	R&D facility	Tag	Characteristic
p53 Y220C inhibitor	JAB-30300	Jacobio	Top target, fast-follow	Leading in the Chinese market in terms of progress, JAB-30300 is expected to become one of the first few drugs to get market approval.
anti-GREM1 mAb	TST003	Transcenta	First-in-class	TST003 has demonstrated promising single agent and combination activities in patient-derived xenograft tumor models from the difficult-to-treat solid tumors resistant to checkpoint inhibitors including castration resistant prostate cancer and microsatellite stable colorectal cancer.
Anti-IL 25 mAb	XKH001	Kanova	First-in-class	Leading in the global market in terms of progress, it is the only IL 25 drugs that has obtained IND approval; IL-25, along with TSLP and IL-33, is one of the three major alarmins in the Th2 pathway, and TSLP and IL-33 have been very successful. Kanova gets a five-star grade in the investment portfolio and has raised over RMB 200 million in Series A. The company's founder Chen Dong is an Academician of Chinese Academy of Sciences.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Opportunity	drugs product	R&D facility	Tag	Characteristic
PKMYT1 inhibitor	AST-NS2301	Allist	Top target, fast folllow	Leading in the Chinese market in terms of progress
GPR75 inhibitor	BEBT-809	BeBetter Med	Top target, fast folllow	Leading in the Chinese market in terms of progress
GSDMD inhibitor	GSDMD inhibitor	Pyrotech Therapeutics	First-in-class	Leading in the global market in terms of progress; several publications in international top journals
ALPK1 inhibitor	DF003	drugs Farm	First-in-class	Leading in the global market in terms of progress, DF-003 is a highly efficient investigational ALPK1 inhibitor that has demonstrated significant preclinical activity in heart and kidney disease models in animals, as well as the ROSAH transgenic mouse model. Moreover, DF-003 has favorable drugs-like properties, including a lower risk of off-target effects and drugs-drugs interactions, as well as a half-life that is suitable for once-daily dosing in humans.
SMAD3 PROTAC	WO2022148459	Jing drugs	First-in-class	Leading in the global market in terms of progress

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Opportunity	drugs	R&D facility	Tag	Characteristic
KIF18A inhibitor	GH2616	Genhouse	Top target, fast follow	Leading in the Chinese market in terms of progress, GH2616 is a third-generation synthetic lethality mechanism, a potent and selective KIF18A inhibitor. It has pharmacokinetics (PK) and ADME (absorption, distribution, metabolism, and excretion) properties, with high oral bioavailability.
GSPT1 molecular glue	FD-001	FenDi Pharmaceutical	Top target, fast follow	FD-001 is a dual-targeted degrader that can effectively kill tumor cells and also regulate the immune system. It has the potential to become the best-in-class drugs molecule, offering improved efficacy and fewer potential toxic side effects.
AR-v7 degrader	HSK38008	Haisco	Top target, first-in-class	Leading in the global market in terms of progress, HSK38008 is a promising oral AR-V7 degrader with better efficacy than enzalutamide and ARV-110.
CDK4 inhibitor	HRS-6209	Hengrui	Top target, fast follow	Leading in the Chinese market in terms of progress, second only to PF-07220060 on a global basis
Anti-TDP43 antibody	SNP210	SciNeuro	Top target, fast follow	Leading in the Chinese market in terms of progress

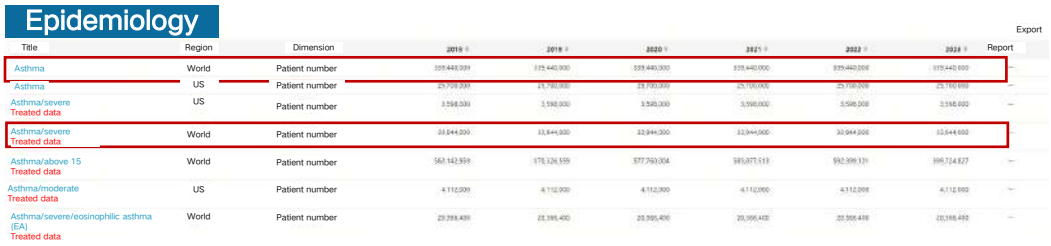
Source: Research and analysis by Pharmcube; NextBiopharm™ database.

There is a substantial demand for high-quality treatment options for asthma, opening a wide avenue for further research and the identification of promising therapeutic strategies for moderate to severe asthma.

1.Epidemiology/ Knowledge card:

Asthma is characterized by Th2 cell-driven eosinophilic airway inflammation. In 2017, there were approximately 315 million asthma patients globally, and the prevalence is increasing sharply. Currently, the main treatment drugs for asthma include bronchodilators (β2 adrenergic receptor agonists, M cholinergic receptor blockers, and theophylline) and anti-inflammatory drugs (glucocorticoids, leukotriene antagonists). Due to individual differences, some patients with difficult-to-treat asthma (more than 10% have severe asthma) still cannot achieve good symptom control. Some biologics, however, act precisely on the Th2-type inflammation pathway.

Epidemiology



Knowledge card

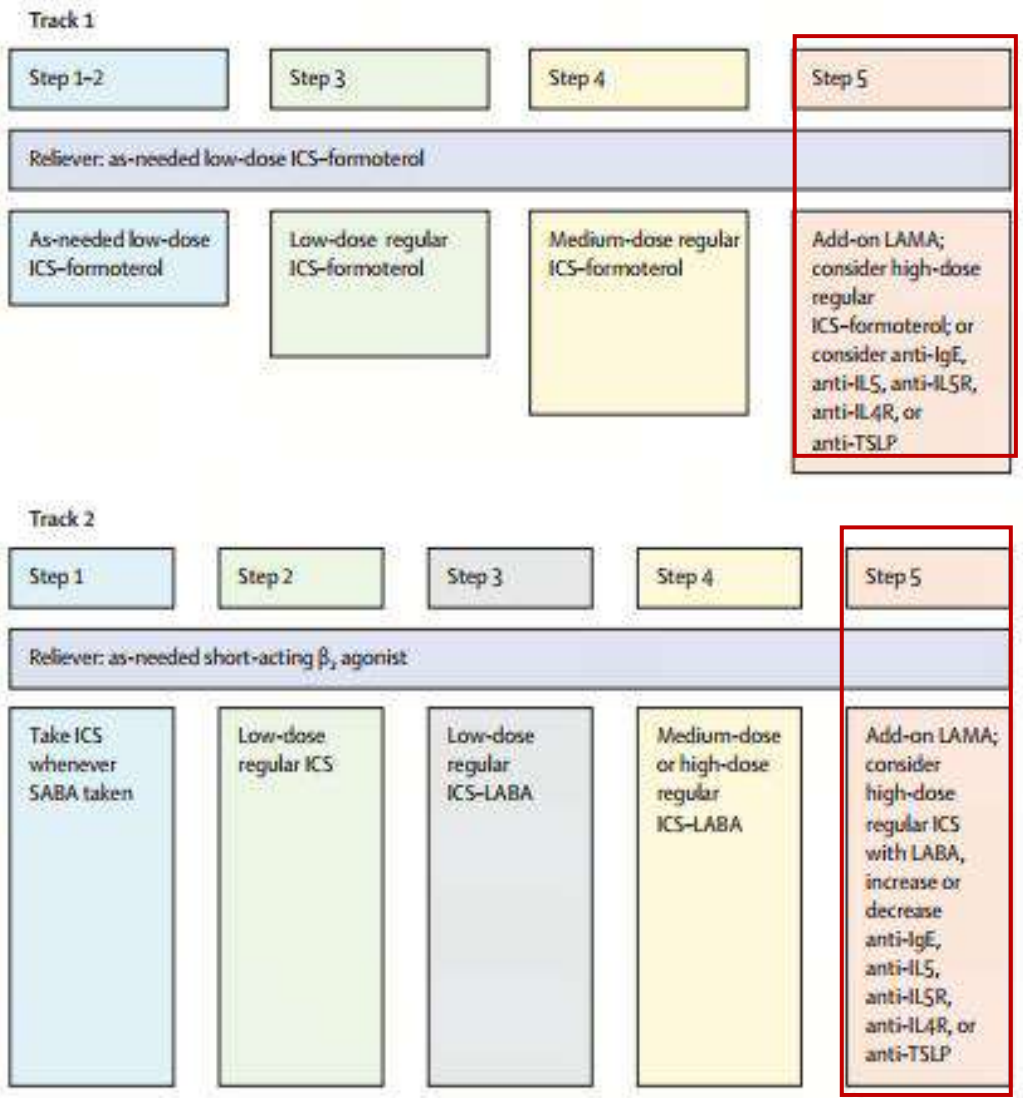
Source: Research and analysis by Pharmcube; NextBiopharm™ database; Asthma; Chinese Guidelines for the Diagnosis and Treatment of Allergic Asthma (2019, the first edition)e

Allergic asthma treatment guidelines from China/U.S. (latest)

Allergic asthma treatment guidelines from China/US (latest)

Treatment plan	Level 1	Level 2	Level 3	Level 4	Level 5
Primary recommended control medication	As needed low-dose ICS-Formoterol	Low-dose ICS or as needed ICS-Formoterol	Low-dose ICS-LABA	Medium-dose ICS-LABA	High-dose ICS-LABA, and according to phenotypes of asthma, also consider anti-IgE, anti-IL-5/5R, anti-IL-4R treatments
Secondary recommended control medication	SABA in combination with low-dose ICS	LTRA or SABA in combination with low-dose ICS	Medium-dose ICS or low-dose ICS in combination with LTRA	High-dose ICS in combination with LAMA or high-dose ICS in combination with LTRA	Plus low-dose oral glucocorticoids (should minimize adverse reactions)
Other control treatment	AIT	AIT, anti-allergic agents[66-67]	AIT, anti-IgE treatment, anti-allergic agents[68]	Anti-IgE treatment, anti-allergic agents[69]	
Recommended relief medication	As needed low-dose ICS-Formoterol				
Other relief medication	SABA as needed				
Avoid exposure to triggers					

Note: ICS refers to inhaled corticosteroid; SABA refers to short-acting β2-agonists; AIT refers to allergen-specific immunotherapy; LABA refers to long-acting β2-agonists; LTRA refers to leukotriene receptor antagonist; LAMA refers to long-acting muscarinic antagonist, LAMA inhalors are for children older than 12 and adults; IL refers to interleukin.



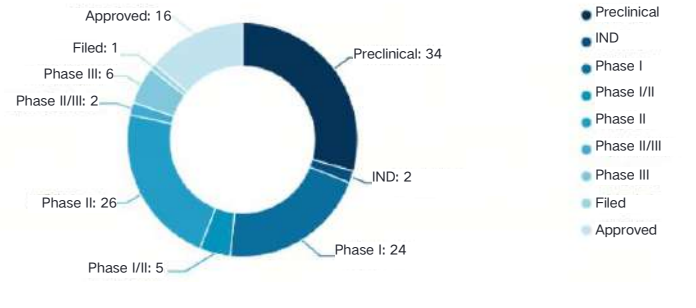
Source: Research and analysis by Pharmcube; NextBiopharm™ database; Asthma; Chinese Guidelines for the Diagnosis and Treatment of Allergic Asthma (2019, the first edition)

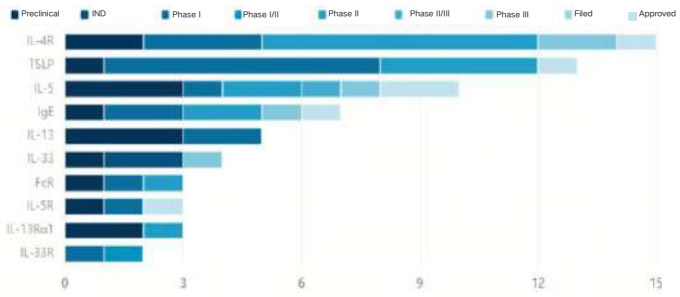
Global competition for moderate/severe asthma treatment is intense, while Chinese offerings are limited.

2. Basic Search/ Trial results:

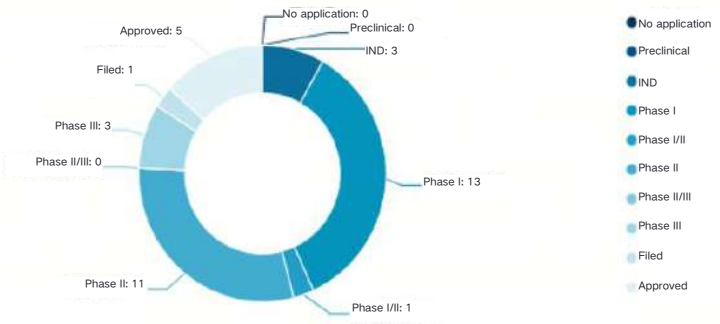
According to the competitive landscape of biologic therapy drugs for asthma under investigation in China and the world, there are already six monoclonal antibody drugs approved globally. The targets of biologics in development are focused on the Th2 inflammation pathway (TSLP, IL-33, IL-4α, IL5/IL-5R, IL-13, etc.). In China, the number of asthma drugs in clinical stages is limited, and aside from omalizumab, there are no other biologic treatments for asthma available on the market.

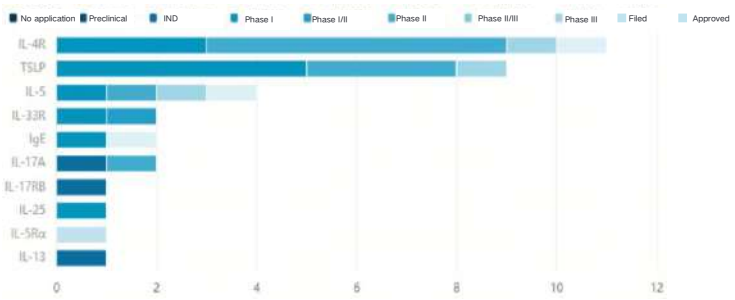
Biologic drugs for asthma under investigation worldwide





Biologic drugs for asthma under investigation in China





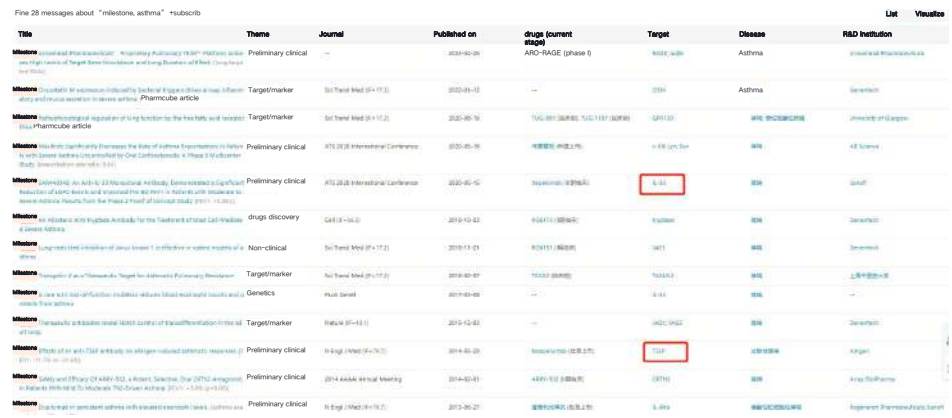
drugs	Target	Indication	Approved time and country	R&D facility	Clinical trial	Trial result
Omalizumab	IgE	adults and pediatric patients 6 or older with uncontrolled moderate-to-severe persistent asthma after step 4 or 5 treatment	2003-06-20(U.S.); 2005-10-24(EU); 2009-01-21(JP); 2017-08-28(CN)	Roche; Novartis	NCT00314575 NCT00079937 CTR20131579	1.Omalizumab reduced the rate of asthma exacerbation by 25%; 2. Omalizumab improved the mean Asthma QoL Questionnaire score (AQLQS) by 0.29, reduced mean daily albuterol puffs by 0.27 puff/d, and decreased mean asthma symptom score by 0.26. Omalizumab reduced the rate of asthma exacerbation by 43%. 1. Omalizumab significantly improved the predicted value of forced expiratory volume in 1 second (FEV1); 2. At week 24, omalizumab-treated patients achieved significant improvement in standardized AQLQ and ACQ scores vs placebo.
Mepolizumab	IL-5	patients aged six years and older with uncontrolled severe eosinophilic asthma after step 4 treatment (subcutaneous injection)	2015-11-04(U.S.); 2015-12-01(EU); 2016-03-28(JP)	GSK	SIRIUS	1. Reduction in the glucocorticoid-dose stratum was 2.39 times greater in the mepolizumab group than in the placebo group; 2. Relative reduction of 32% in the annualized rate of exacerbations, and a reduction of 0.52 points with respect to asthma symptoms.
Reslizumab	IL-5	patients aged 12 years and older with uncontrolled severe eosinophilic asthma after step 4 treatment (subcutaneous injection)	2016-03-23(U.S.); 2016-08-15(EU)	Teva Pharmaceutical; Merck &Co.; UCB	NCT02452190	1.No significant difference in the exacerbation rate between reslizumab and placebo; 2. In the subgroup of patients with blood eosinophil counts of 400 cells per μL or more, reslizumab significantly reduced exacerbation risk and extended time to first exacerbation.
Benralizumab	IL-5R	patients aged 18 years and older with uncontrolled severe eosinophilic asthma after step 4 to 5 treatment (intravenous injection)	2017-11-14(U.S.); 2018-01-08(EU); 2018-01-19(JP)	AstraZeneca Kyowa Kirin	ANDHI	1. 49% reduction in the annual rate of asthma exacerbations; 2. Significant improvement in the St. George's Respiratory Questionnaire (SGRQ) total score.
Dupilumab	IL-4Rα	patients aged 6 years and older with severe eosinophilic asthma/Th2 asthma or adults and young patients with oral glucocorticoid-dependent severe asthma	2018-10-19(U.S.); 2019-03-26(JP); 2019-05-07(EU)	Regeneron Pharmaceuticals; Sanofi	QUEST	1. Dupilumab lowered the annualized rate of severe asthma exacerbations by 47.7% and increased FEV1 by 0.32 L; 2. Among patients with a blood eosinophil count of 150 or more per cubic millimeter, or patients with a higher FeNO ⩾25 ppb, dupilumab lowered the annualized rate of severe asthma exacerbation by 65.8%.
Tezepelumab	TSLP	patients aged 12 years and older with severe asthma	2021-12-17(U.S.); 2022-09-19(EU); 2022-09-26(JP)	Amgen; AstraZeneca	NCT03347279	Tezepelumab significantly reduced the annualized asthma exacerbation rate.

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Among epithelial cell-derived alarmins, TSLP and IL-33 are top targets, and IL-25 has potential for inflammatory treatment.

3. Translational medicine:

Epithelial cell-derived alarmins, including TSLP, IL-25, and IL-33, are released upon allergen or pathogen-induced epithelial damage, and are all important initiators of type 2 immunity. Currently, IL-33 and TSLP are top targets while limited researches are conducted on IL-25, possibly because the efficacy of IL-25 is inferior to the other two during in vivo and in vitro studies.

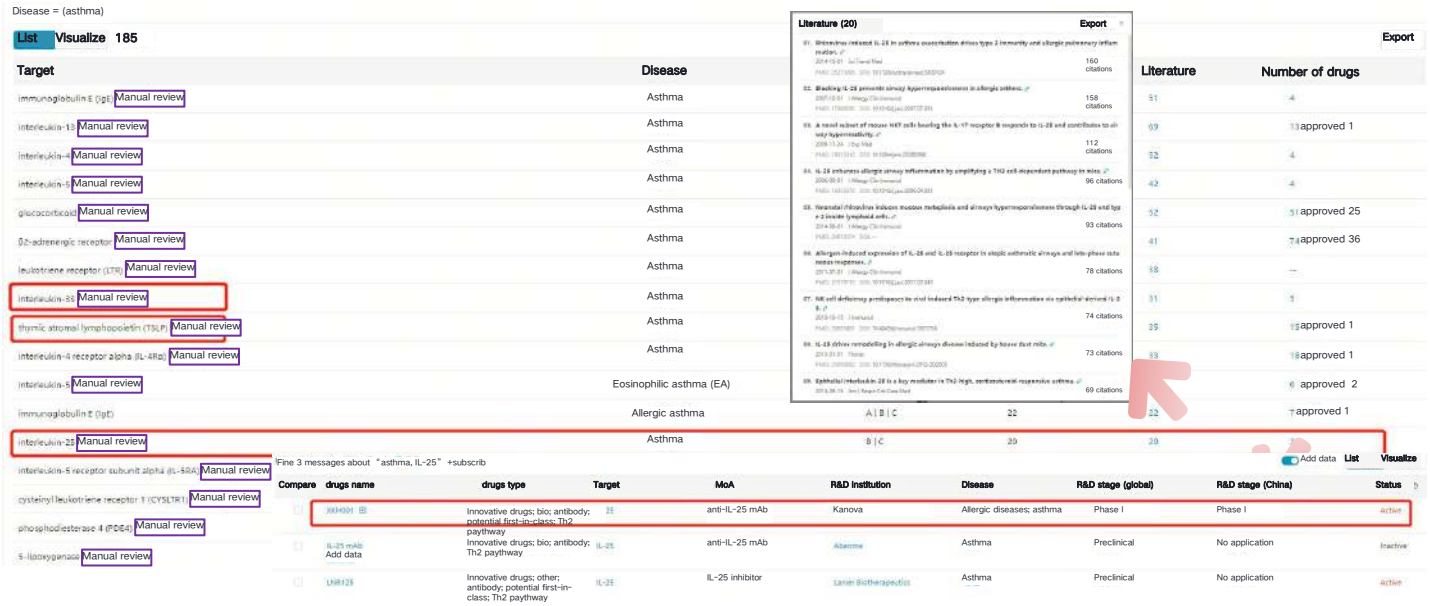


Source: Research and analysis by Pharmcube; NextBiopharm™ database.

Pharmcube's highlight module: Select IL-15 in the target matrix and then apply filters such as rated B or above in relation with asthma, scored 20 or more, limited number of investigational drugs, and the stage of clinical trial (only one product has achieved phase I).

4. Target Array:

Through analysis of numerous scientific publications and the application of AI tagging technology, it has been determined that the IL-25 target holds a promising score of 20 for potential asthma treatment efficacy, ranking just behind IL-33 and TSLP, both of which have already passed PoC validation. Currently, there are only three asthma drugs targeting IL-25 under investigation. Among these, Kanova's XKH001 for the treatment of moderate to severe asthma has progressed to Phase I clinical trials, placing it at the forefront of global development in this category.

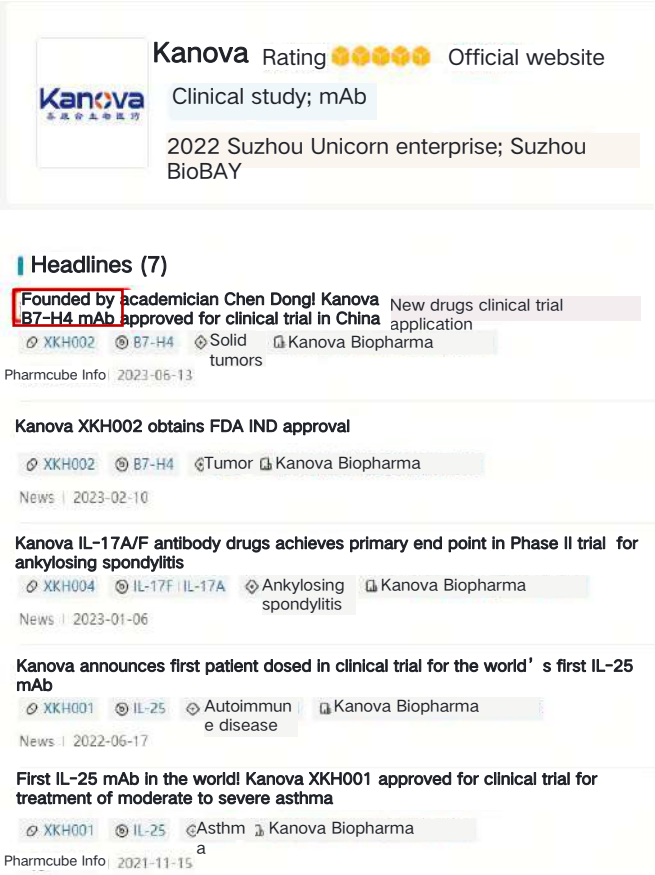


Source: Research and analysis by Pharmcube; NextBiopharm™ database.

A closer review of the information about the company and its pipeline unveils a promising investment opportunity.

5. Company profile:

Kanova is rated as a 5-star enterprise in the Medalpha database. They have raised over RMB 100 million in a Series B+ round. Their founder Chen Dong is a world renowned immunologist and an academician of the Chinese Academy of Sciences. Kanova focuses on developing macromolecules for autoimmune diseases and immuno-oncology. They currently have four products in their pipeline, most of which are world-leading/first-in-class.



Time	Round	Amount	Investors	Lead Investor	Estimated valuation ($)
2023-07-26	B+	RMB 100 billion +	GTJA | Guangzhou Xintai | Lotus Lake Capital | LSV Capital | Northern Light | Hainan Dongfang Fenghai | CD Capital	GTJA	~USD 250 million
2021-12-24	Equity transfer	--	Jinyuan Group	--	--
2021-07-13	B	USD 10 million +	CR Capital | Lotus Lake Capital | CSSD | 3H Health Investment | CD Capital	CD Capital	~USD 130 million
2018-11-26	A	RMB 115 million	Kington Capital | Yuanbio Venture Capital | Lotus Lake Capital | Northern Light	Northern Light	USD 100million -
2016-02-02	Pre-A	--	Baijiahui | BOHE Angel Fund | Legend Star	--	--
2015-11-13	Angel	RMB 26 million	Yuanbio Venture Capital	--	--

Pipelines (4)

Bio Chem

drugs name	Target	Type	Indications	Clinical stage	Clinial Time	Market approval	Autonomy	Transaction	Invested
XKH004	IL-17F IL-17A	Bio	Ankylosing spondylitis | psoriasis	Phase III	--	--	Unknown	No	Yes
XKH001	IL-25	Bio	Asthma | allergic diseases	Phase I	2022-06-15	--	Unknown	No	Yes
				Clinical application	--	--	Unknown	No	Yes
XKH007	B7-H3	Bio	Cancer	Preclinical	--	--	Unknown	No	No

XKH001 is the first-in-class IL-25 mAb for treatment of moderate to severe asthma

Source: Research and analysis by Pharmcube; NextBiopharm™ database.

IL-25 is a new mechanism in immunotherapy and XKH001 is a potential first-in-class product with strong prospects for overseas development.

Product with strong potential for overseas development: XKH001

MoA: Anti-IL-25 mAb

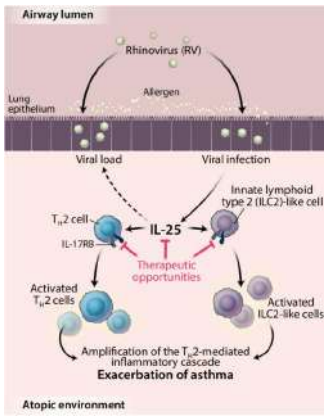
R&D facility: Kanova

Latest stage: Phase I (global/China)

Kanova 鑫康合生物医药

Target advantage:

Inhibiting IL-25 provides promising therapeutic opportunities for autoimmune diseases.[1]



IL-25 uniquely acts in the upstream of Th2 cell signaling pathway and is abundantly expressed in the central nervous system and the submucosa of bronchi asthma patients. It can modulate allergic reactions and type 2 immunity-driven diseases.

By blocking the binding of IL-25 to its receptor, XKH001 is expected to inhibit and decrease the inflammatory reaction in the downstream pathway.

IL-25, TSLP, and IL-33 are three major alarmins in the Th2 pathway, and TSLP and IL-33 have been very successful.

Competition advantage:

Research on IL-25 remains at an early stage, resulting in less intense competition. Big MNCs' pipeline layout is amplifying the allure of this target. Among all drugs under investigation, XKH001 is advancing at the fastest pace, a potential first-in-class.

IL-25 global R&D landscape

Drugs	MoA	R&D facility	Disease	Global	China
XKH001	Anti-IL-25 mAb	Kanova	allergic diseases; asthma	Phase I	Phase I
22C7	Anti-IL-25 mAb	Pfizer	dermatitis	Preclinical	NA
LNR125	IL-25 inhibitor	Lanier	asthma	Preclinical	NA

Company advantage:

Kanova Biopharma was founded by Chen Dong, an academician of the Chinese Academy of Sciences, who brings a strong reputation to the company.

Chen Dong | Founder, Chief Scientific Adviser

Academician of the Chinese Academy of Sciences

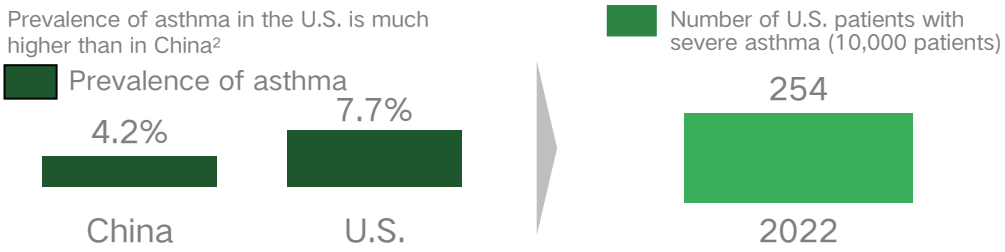
Director for the Shanghai Immune Therapy Institute

Professor at Tsinghua University School of drugs

Professor Chen Dong is a world renowned immunologist. He has made many pioneering contributions in the field of T cell differentiation and autoimmune diseases. His works have paved ways for the treatment of immune-associated diseases.

Market advantage:

The market size for overseas asthma patients is considerable, and there is an urgent need to develop new drugs for patients with severe asthma.



Patients with severe asthma account for about 10% in number, but 60% in medical expenses[3], representing a significant health economic burden. Patients with severe asthma who do not respond to standard treatments urgently need more effective new medications.

1 IL-25: The Missing Link Between Allergy, Viral Infection, and Asthma ;
2 Prevalence, risk factors, and management of asthma in China: a national cross-sectional study;
3 Direct health care costs associated with asthma in British Columbia

Source: Research and analysis by Pharmcube; NextBiopharm™ database