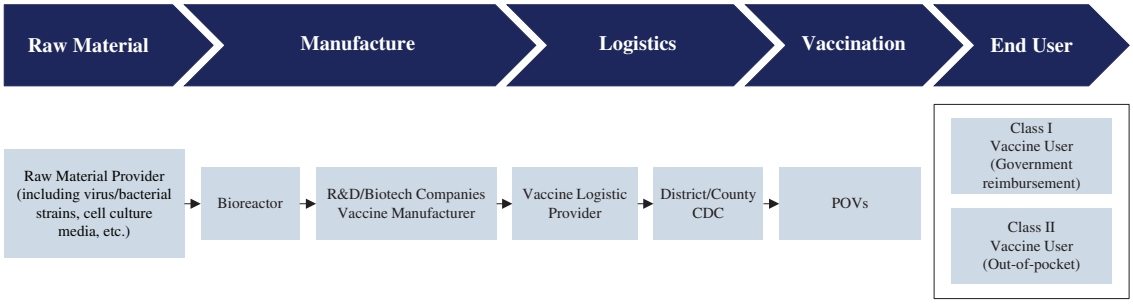
Certain information and statistics set out in this section have been extracted from various official government publications, market data providers and a report commissioned by us and prepared by an independent third party, Frost & Sullivan. The information from official government sources has not been independently verified by us, the Joint Sponsors,* [REDACTED] *or any of their respective directors, officers, employees, advisers or agents or any other parties involved in the* [REDACTED]*, and no representation is given as to its accuracy, fairness and completeness.

OVERVIEW OF VACCINES

Vaccines are biological preparations that provide active acquired immunity against particular diseases. A vaccine typically contains one or several antigens from, or similar to, a disease-causing microorganism and improves immunity to a particular disease upon administration by inducing specific immune responses. Traditional vaccines are usually made by growing cultures of the target virus. Viruses can grow in different cell lines, such as primary cells, Vero cells or human diploid cells. Viruses are usually grown and cultured using bioreactors before the cell cultures are harvested and purified. The vaccine manufacturer then completes formulation, filing, packaging and quality control assessment before the cold-chain logistic provider delivers the vaccines to district- and county-level CDCs, which then deliver the vaccines to qualified POVs based on local vaccination needs. Vaccines in China are classified as Class I and Class II. Class I vaccines are reimbursed by the government whereas Class II vaccines are paid by vaccinees out-of-pocket. The following chart sets forth key participants in the vaccine industry value chain.



Generally, based on the technical design, vaccines can be categorized into live attenuated vaccines, inactivated vaccines, viral vector vaccines, recombinant protein vaccines and nucleic acid vaccines.

- *Live attenuated vaccines*. Live attenuated vaccines contain pathogens that have been artificially screened to reduce virulence, so that the pathogens do not cause disease but still retain the ability to provoke an immune response and replicate. Live attenuated vaccines are used for the prevention of influenza, measles and varicella.

- *Inactivated vaccines*. Inactivated vaccines are produced by inactivating pathogenic microorganisms using heat or chemical agents, where the microorganisms lose pathogenic ability while retaining antigenic properties. These vaccines generally require multiple administrations, but can easily made into combination or multivalent vaccines. Inactivated vaccines primarily include whole virion inactivated vaccines, split-virion vaccines and inactivated subunit vaccines.

- *Viral vector vaccines*. Viral vector vaccines are developed through the integration of genes encoding antigenic proteins into low- or non-pathogenic viral vectors, which facilitate the stable expression of antigens within the human body, thereby inducing targeted immune responses. Viral vector vaccines primarily include adenovirus vector vaccines, lentivirus vector vaccines and adeno-associated virus vector vaccines.

- *Recombinant protein vaccines*. In the development of recombinant protein vaccines, the gene-encoding target antigen is inserted into an appropriate expression vector. This vector is subsequently introduced into host cells, such as insect cells, bacteria, yeast or mammalian cells. Under specifically controlled induction conditions, these host cells are used to produce substantial quantities of the antigen protein. Recombinant protein vaccines primarily include recombinant subunit vaccines, virus particle–like vaccines and nanoparticle vaccines.

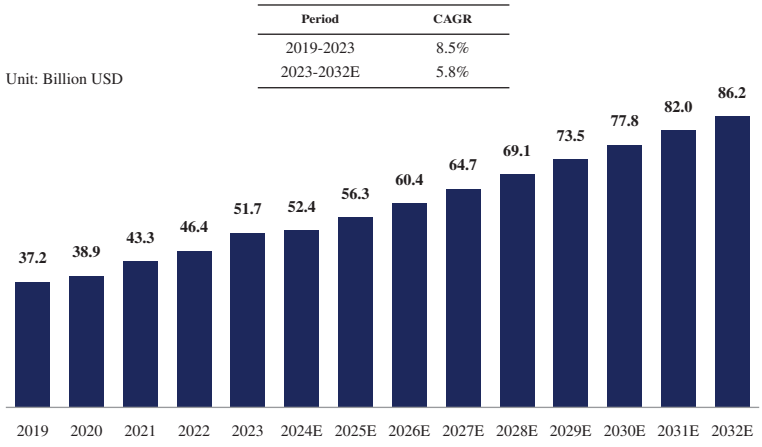
- *Nucleic acid vaccines*. Nucleic acid vaccines operate by directly delivering exogenous genes, such as DNA or RNA, that encode a specific antigen protein into host cells. These host cells then utilize their intrinsic expression systems to synthesize the corresponding antigen protein. Nucleic acid vaccines primarily include DNA vaccines and mRNA vaccines.

OVERVIEW OF THE HUMAN VACCINE MARKET

Global Human Vaccine Market

Since its emergence, vaccine has been one of the most important innovations in the science of public health. The global human vaccine market, in terms of sales revenue and without considering COVID-19 vaccines, increased from US$37.2 billion in 2019 to US$51.7 billion in 2023, at a CAGR of 8.5%. Driven by the continuous commercialization of innovative vaccines and market growth in emerging countries, such as China, the global human vaccine market is expected to reach US$86.2 billion in 2032 at a CAGR of 5.8% from 2023 to 2032. The following chart sets forth the historical and estimated size of the global human vaccine market for the periods indicated.

Global Human Vaccine Market, 2019-2032E



Source: Frost & Sullivan analysis (based on annual reports of relevant companies)

Note: COVID-19 vaccines are not taken into consideration.

The history of vaccine development dates back to 1798 with the creation of the smallpox vaccine, which set the foundation for subsequent innovations. In the 19th century, Louis Pasteur's work led to the development of live attenuated cholera and inactivated anthrax vaccines. Between 1890 and 1950, there was significant growth in bacterial vaccine development, exemplified by the Bacillus-Calmette-Guerin (BCG) vaccine for the prevention of tuberculosis, which is still in use today. In 1972, recombinant genetic vaccines were developed. Among genetically engineered vaccines, the recombinant hepatitis B vaccine demonstrated notable success by providing a stronger immune response. The late 1980s and early 1990s saw increased research into nucleic acid vaccines, driven by gene therapy experiments.

In recent decades, advancements in molecular genetics have significantly impacted vaccine development, facilitating progress in immunology, microbiology and genomics. Developments include the recombinant meningococcal B vaccine and new methods for manufacturing seasonal influenza vaccines. Molecular genetics is facilitating advancements in vaccine delivery systems, such as DNA vaccines and new adjuvants, alongside efforts to develop vaccines for challenging diseases like tuberculosis, Ebola and HIV. In 2020, the deployment of mRNA vaccines, developed by Pfizer/BioNTech and Moderna, marked a notable development as part of the response to the COVID-19 pandemic. These vaccines represent the first approved use of mRNA technology in vaccine production, establishing a new process benchmark in the field. The following chart sets forth the details of the vaccines (other than COVID-19 vaccines) approved by the FDA from 2019 to 2023.

Year	Number of Vaccines Approved	Trade Name	Indications	Company Name
2019	3	DENGVAXIA	Dengue fever	Sanofi
		JYNNEOS	Smallpox, monkeypox	Bavarian Nordic
		ERVEBO	Ebola	MSD
2020	2	AUDENZ	Influenza	Seqirus
		MenQuadfi	Meningococcal disease	Sanofi
2021	3	PREHEVBRIO[(1)]	Hepatitis B	VBI Vaccines
		VAXNEUVANCE	Pneumococcal	MSD
		TICOVAC	Tick-borne encephalitis	Pfizer
2022	2	IPOL	Poliomyelitis	Sanofi
		PRIORIX	MMR	GSK
2023	5	CYFENDUS	Anthrax	Emergent BioSolutions
		Abrysyo	RSV	Pfizer
		Arexvy	RSV	GSK
		Penbraya	Meningococcal disease	Pfizer
		Ixchiq	Chikungunya virus	Valneva

Sources: FDA, Frost & Sullivan

Notes:

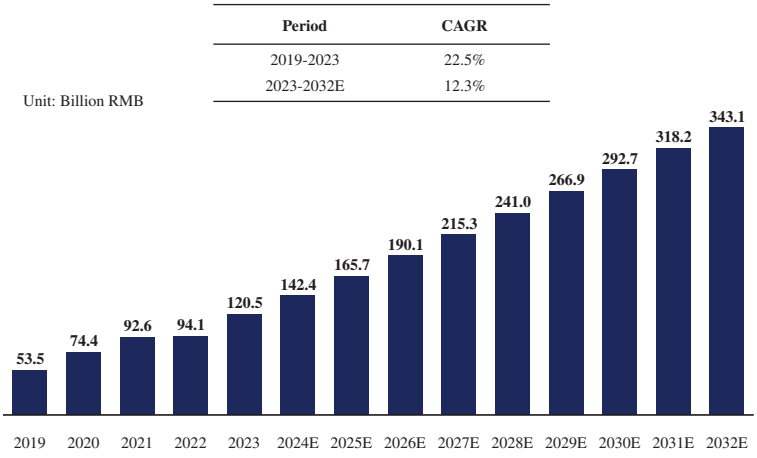
(1) PREHEVBRIO has been voluntarily withdrawn from the market by VBI Vaccines.

(2) COVID-19 vaccines are not included in the chart.

The Chinese Human Vaccine Market

The human vaccine market in China, in terms of production value and without considering COVID-19 vaccines, grew from RMB53.5 billion in 2019 to RMB120.5 billion in 2023, at a CAGR of 22.5%. Driven by the expected continuous launch of innovative vaccines, the human vaccine market in China is expected to further grow to RMB343.1 billion in 2032, at a CAGR of 12.3% from 2023 to 2032. The following chart sets forth the historical and estimated size of the human vaccine market in China for the period indicated.

Human Vaccine Market in China, 2019-2032E

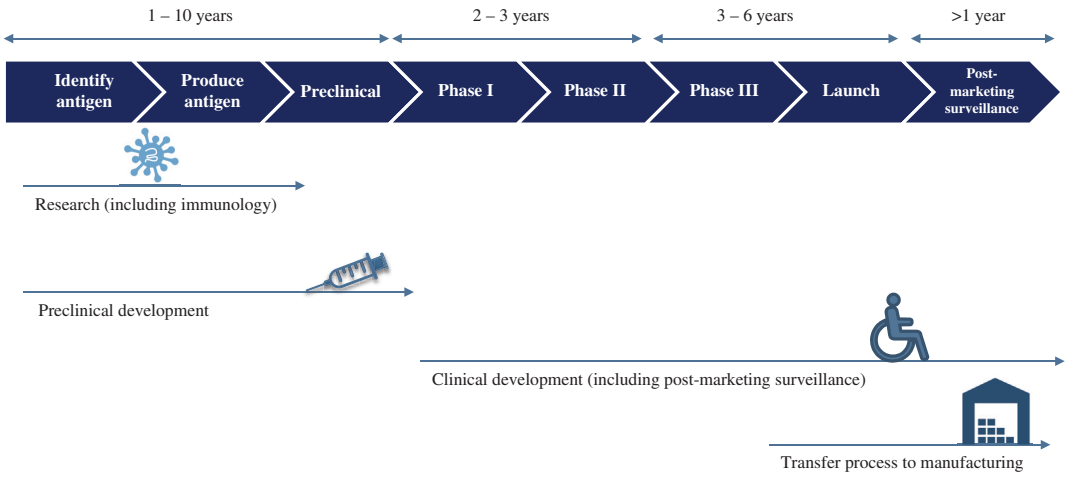


Sources: Frost & Sullivan analysis (based on annual reports of relevant companies)

Note: Production value is calculated by multiplying the total number of lot release by the respective unit price of each vaccine. COVID-19 vaccines are not taken into consideration.

In the PRC, vaccines are categorized into two classes. Class I vaccines are vaccines provided free of charge to citizens. They are procured at relatively low prices under government procurement programs, which are managed by CDCs. Class II vaccines are paid for by vaccinees themselves or insurance companies, and are relatively more expensive. Class II vaccines dominate the vaccine market in China in terms of production value. In terms of production revenue, the Class II vaccine market in China increased from RMB51.4 billion in 2019 to RMB115.7 billion in 2023, at a CAGR of 22.5%. Driven by increased awareness and ability to pay and introduction of new vaccines, particularly with the anticipated increase in the manufacturing of Class II vaccines in the coming years, the Class II vaccine market in China is expected to reach RMB336.7 billion in 2032, at a CAGR of 12.6% from 2023 to 2032.

The development of vaccines in China is a prolonged process, taking more than 15 years on average to bring a vaccine to commercialization after identifying the antigen. The following graph illustrates the lifecycle of vaccine development in China.



Source: Frost & Sullivan analysis

In addition, as China enacted comprehensive regulations governing the vaccine industry, covering the entire value chain from research and development to inoculation, only a limited number of vaccines were approved by the NMPA each year in the past few years. The following chart sets forth the details of the vaccines approved by the NMPA from 2019 to 2023.

Year	Number of Vaccines Approved	Trade Name	Indications	Company Name
2019	4 1 5	Quadrivalent influenza virus split-virion vaccine	Influenza	GDK (金迪克生物)
		SHINGRIX	Herpes zoster	GSK
		Varicella vaccine	Varicella	Sinovac (科興生物)
		WEUPHORIA (沃安欣)	Pneumonia	Walvax (沃森生物)
		Cecolin (馨可寧)	Cervical carcinoma	Wantai BioPharm (萬泰生物)
2020	5 5	Wugan (霧感)	Influenza	BCHT (百克生物)
		Diphtheria, Tetanus and Acellular Pertussis Combined Vaccine, Adsorbed	Diphtheria, tetanus and acellular pertussis	Minhai (民海生物)
		Group A and Group C Meningococcal Conjugate Vaccine	Cerebrospinal meningitis	Olymvax (歐林生物)
		Influenza Vaccine (Split Virion), Inactivated, Quadrivalent	Influenza	Sinovac (科興生物)
		23-valent Pneumococcal Polysaccharide Vaccine	Pneumonia	Sinovac (科興生物)
2021	8 8	Menphecia (美奈喜)	Cerebrospinal meningitis, pneumonia	CanSino (康希諾生物)
		Menhycia (曼海欣)	Cerebrospinal meningitis, pneumonia	CanSino (康希諾生物)
		Rabies Vaccine (Vero Cell), Freeze-dried	Rabies	Yidu Biotechnology (亦度生物)
		Weiminfeibao (維民菲寶)	Pneumonia	Minhai (民海生物)
		Haemophilus Influenza Type b Conjugate Vaccine	Cerebrospinal meningitis, pneumonia	Minhai (民海生物)
		Poliomyelitis Vaccine (Vero Cell), Inactivated, Sabin Strains	Poliomyelitis	Sinovac (科興生物)
		Influenza Vaccine (Split Virion), Inactivated, Quadrivalent	Influenza	Shanghai Institute of Biological Products (上海生物製品研究所)
		Rabies Vaccine (Vero Cell), Freeze-dried	Rabies	Changchun Institute of Biological Products (長春生物製品研究所)
2022	2 1 3	AdimFlu-S (安定伏)	Influenza	Adimmune (國光生物)
		Walrinvax (沃澤惠)	HPV	Walvax (沃森生物)
		Group ACYW135 Meningococcal polysaccharide vaccine	Cerebrospinal meningitis	Beijing Institute of Biological Products (北京生物製品研究所)
2023	9 9	live attenuated zoster vaccine (感維)	Herpes zoster	BCHT (百克生物)
		freeze-dried rabies vaccine, vero cell	Rabies	Hualan Bio (華蘭生物)
		Tetanus Vaccine, Adsorbed	Tetanus	Hualan Bio (華蘭生物)
		VaxigripTetra (凡爾佳)	Influenza	Sanofi
		ROTALAN (瑞特威)	Rotavirus gastroenteritis	Lanzhou Institute of Biological Products (蘭州生物製品研究所)
		Quadrivalent Subunit Influenza Vaccine (慧爾康欣)	Influenza	***the Company***
		23-Valent Pneumococcal Polysaccharide Vaccine	Pneumonia	ZFSW (智飛生物)
		freeze-dried rabies vaccine	Rabies	Minhai (民海生物)
		freeze-dried rabies vaccine, Vero cell	Rabies	CuroVax (康潤生物)

Domestic Vaccines
Imported Vaccines

Sources: NMPA, Frost & Sullivan analysis

Note: COVID-19 vaccines are not included in the chart.

The strict regulations are designed to elevate the quality of vaccines and eliminate unlawful practices within the industry. For example, the PRC government promulgated regulations in 2016 to restructure the vaccine market by streamlining distribution processes and tightening safety measures for transportation and storage. Class I vaccines are purchased through a centralized bidding process by provincial-level CDCs and subsequently allocated to district- and county-level CDCs, which then distribute them to POVs as needed. Manufacturers of Class II vaccines are now required to sell directly to, and settle payments with, district- and county-level CDCs following successful public tender bids at the provincial level, except for the Beijing CDC, which manages its procurement and allocation. Enhancements in the public tender procedure, cold chain management and safety protocols have bolstered overall vaccine safety. Furthermore, the PRC has established a national electronic traceability collaboration platform with uniform standards. Vaccine manufacturing license holders are mandated to implement electronic traceability systems, while disease prevention institutions must accurately record and provide traceability data. Since 2002, the NMPA, alongside other government departments, has enhanced the traceability across the entire vaccine lifecycle by including more vaccines under the scope of the lot release system. By 2016, comprehensive lot release management was achieved for all marketed vaccines, with revisions in 2020 mandating stringent review and testing procedures for each vaccine lot. These initiatives underscore China's commitment to ensuring the highest standards of vaccine safety and public health protection. Vaccine distribution and administration in China also involve a robust network of POVs, which integrates essential information, particularly for Class II vaccines, and offers pre-vaccination health consultations along with post-vaccination monitoring of adverse reactions.

Market Drivers and Trends

The primary drivers and future trends of vaccine market in China include:

- *Technical development and availability of new vaccines.* China's vaccine industry has advanced significantly, covering both Class I vaccines and Class II vaccines. Continuous R&D efforts focus on improving existing vaccines and developing next-generation vaccines for diseases such as rabies, malaria, HPV and tuberculosis. Innovations like launch of EV71 vaccine for HFMD, COVID-19 vaccines and domestic PCV13 vaccines, highlight the strong R&D capabilities of domestic companies. These efforts are enhancing vaccine attributes, including acceptability, cost-effectiveness and protection. Companies with robust technical platforms are well-positioned to optimize the design of new vaccines, aligning with market needs and expanding production to meet regional demand. Advances in biotechnology, such as the shift to bioreactor technology, have also improved vaccine quality and efficacy. This technological progress allows manufacturers to offer new vaccine products that better meet consumer demands. Such focus on technological development and innovation is poised to drive significant growth in the Chinese vaccine market.

- *Favorable policies.* The Chinese government has introduced several policies to stimulate the vaccine market. Initiatives such as the Guidelines of the Plan for Development of the Pharmaceutical Industry (《醫藥工業發展規劃指南》) and the Health and Wellness Plan in the Thirteenth Five-Year Plan (《"十三五"衛生與健康規劃》) focus on promoting R&D for multivalent vaccines and expanding national immunization programs. These policies underline the strategic priority on disease prevention, thereby driving market expansion. In addition, policies such as the "Opinions on Further Strengthening Vaccine Circulation and Vaccination Management" (《關於進一步加強疫苗流通和預防接種管理工作的意見》) promote large-scale production of domestic vaccines and industrialization of new vaccines, particularly for combination vaccines and multivalent vaccines. As a result, domestic vaccine manufacturers are expected to gain significant market share in the Class II vaccine market.

- *Increasing affordability and awareness of vaccines.* Economic growth in China has improved affordability and healthcare spending on vaccines. Increased health awareness, especially after COVID-19, is boosting vaccination rates. Rising disposable income has further enhanced the ability and willingness of citizens to pay for vaccines.

- *Resistance to therapeutic drugs and lack of effective treatments.* Drug resistance and the absence of effective treatments for infectious diseases like rabies underscore the importance of vaccination. This realization has prompted greater promotion and adoption of vaccines, thus fueling market growth.

- *Being geared to international standards.* China's alignment with international standards, evidenced by WHO pre-certification eligibility and International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH) membership, positions domestic manufacturers to expand globally. This commitment to meeting global benchmarks is likely to open new international markets.

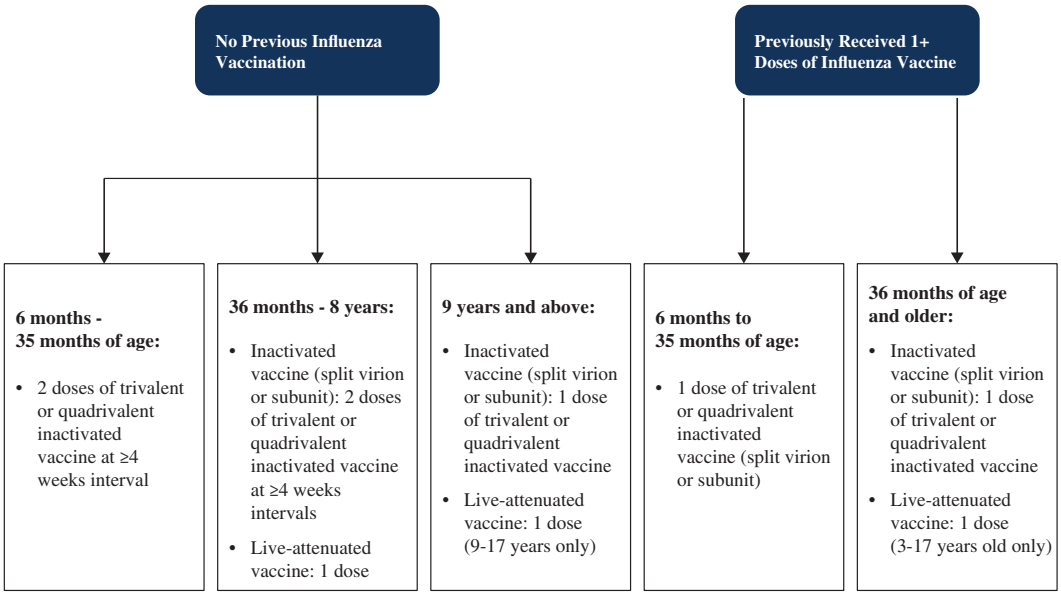
- *Developing multivalent and combination vaccines.* The demand for multivalent and combination vaccines is rising, driven by their effectiveness in preventing multiple diseases. While global companies currently dominate, several Chinese firms are working on developing new multivalent vaccines to meet growing demand.

INFLUENZA VACCINES

Overview of Influenza

Influenza is a contagious respiratory illness caused by influenza viruses that infect the nose, throat and sometimes the lungs. Influenza viruses are categorized into four types: A, B, C and D. Types A and B are responsible for seasonal flu epidemics, with influenza A virus being unique in its potential to cause pandemics due to their ability to emerge as new strains that spread efficiently among humans. Influenza type C typically causes mild illness, while influenza D primarily affects cattle and does not infect humans. Most experts believe that influenza viruses primarily spread through tiny droplets expelled when infected individuals cough, sneeze or speak, and can also be transmitted by touching contaminated surfaces and then touching the mouth, nose or eyes. Influenza can cause mild to severe illness and can lead to death at times. Common symptoms of influenza include fever, headaches, runny nose, cough, sore throat, body aches, nausea, fatigue and chills. Influenza may also involve complications such as bacterial pneumonia, ear infections, sinus infections and worsening of chronic medical conditions, such as congestive heart failure or asthma. The best way to prevent influenza is by getting an annual flu vaccination. For the elderly over 65 years old, children under five years old and people with certain chronic medical conditions, there is an increased risk of developing severe complications if they are infected with influenza. According to WHO, there are around one billion cases of seasonal influenza annually, including approximately 3 to 5 million cases of severe illness that lead to approximately 290,000 to 650,000 respiratory deaths annually.

The WHO and China CDC have provided guidelines for influenza vaccination, targeting specific priority groups to mitigate the risks associated with the virus. The WHO emphasizes the importance of vaccinating pregnant women at any stage of pregnancy, given their increased vulnerability to severe influenza-related illnesses. Children aged six months to five years, particularly those under two years, are also identified due to the significant risk of serious illness they face. Additionally, the elderly population, specifically those aged 65 and older, along with individuals suffering from chronic diseases, are regarded as high-risk groups warranting prioritization in vaccination efforts. Health care workers are highlighted due to their dual role in protecting themselves and vulnerable patients from influenza. Similarly, China CDC underscores the necessity for vaccination among medical personnel, participants and staff at large events and vulnerable individuals in communal settings, such as nursing homes and long-term care facilities. Key populations including teachers, students and individuals in detention facilities are also noted. Further, particular consideration is given to the elderly aged 60 and over, infants of 6-23 months and their family members and caregivers, people with chronical disease and pregnant women or women planning to become pregnant during the influenza season. China CDC also stresses that vaccination should be made available to all people over six months old who are willing to be vaccinated and have no contraindications. China CDC has also published a guideline specifying the number of doses of vaccine to be administered, which is summarized in the following chart.



Sources: CDC, Frost & Sullivan analysis

Overview of Influenza Vaccines

Based on the technical design, influenza vaccines can generally be categorized into whole-virion inactivated vaccines, split-virion vaccines, inactivated subunit vaccines, live attenuated vaccines, recombinant vaccines and mRNA vaccines.

- *Whole-virion inactivated influenza vaccine.* This traditional vaccine involves cultivating the influenza virus and subsequently inactivating it using heat or chemical methods. It contains complete virus particles, preserving various antigenic proteins, which can induce a broad immune response. Although these vaccines have a long history of application and are noted for their relatively straightforward manufacturing process, they have relatively high side-effect profile.

- *Split-virion vaccine.* This type of vaccine retains not only influenza virus nucleoprotein, matrix protein and other internal proteins but also surface antigens. The process involves inactivating the virus, followed by applying a lytic agent to disrupt the viral lipid membrane, facilitating the purification of viral antigens. While its antigen composition is more complex than inactivated subunit vaccines, this complexity may lead to inferior safety profiles.

- *Live attenuated influenza vaccine.* Created using attenuated strains of the virus obtained through virulence reduction or artificial selection, these vaccines mimic natural infections without inducing disease. They stimulate robust, long-lasting immune responses by activating the immune system in a manner similar to a natural infection. However, these vaccines are unsuitable for individuals with compromised immune systems owing to the presence of live viruses.

- *Inactivated subunit vaccine.* Refined from split-virion vaccines, these vaccines focus on isolating and purifying surface proteins haemagglutinin (HA) and neuraminidase (NA). The enhanced purification leads to these vaccines with single antigenic components, providing improved safety and reduced incidence of side effects due to their antigen's simplicity and high antigen purity.

- *Recombinant vaccine.* Utilizing genetic engineering techniques, recombinant vaccines are developed by introducing DNA sequences that encode viral antigens into the expression system. This technique facilitates antigen expression and purification before formulation into vaccines, often employing the baculovirus-insect cell expression system. This method ensures high antigen purity and safety, but has relatively weak immunogenicity, which requires the use of appropriate adjuvants to boost immunogenicity.

- *mRNA vaccine.* These vaccines incorporate mRNA that encodes for specific antigen proteins. Once inside the body, the mRNA directly encodes the antigen protein to stimulate immune responses, bypassing the conventional viral replication and transcription processes. mRNA vaccines offer rapid and cost-effective production with high safety profiles, ideal for responding swiftly to infectious disease pandemics, although challenges remain in terms of long-term safety and efficacy evaluations.

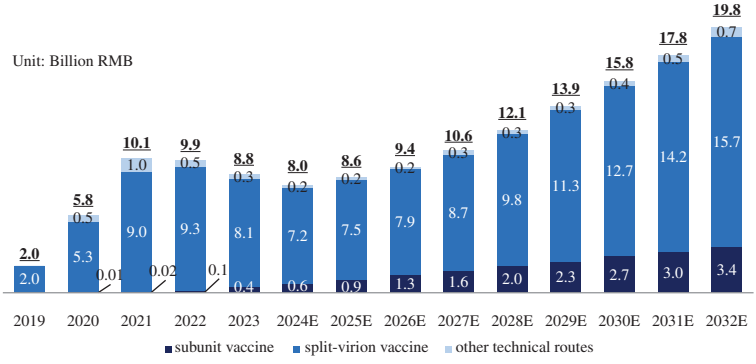
Influenza vaccines can also be categorized based on the "valence," which describes their spectrum of protection against various influenza virus strains. Currently marketed influenza vaccines primarily include trivalent vaccines and quadrivalent vaccines. Trivalent vaccines are designed to offer protection against three influenza viruses: two influenza A viruses (usually H1N1 and H3N2) and one influenza B virus. These vaccines are designed to target the most prevalent strains anticipated to circulate during the influenza season but may not provide comprehensive protection against all circulating B strains. In contrast, quadrivalent vaccines expand on the trivalent formulation by including an additional B virus strain Yamagata, which increases the breadth of protection. This quadrivalent vaccine addresses the concern regarding the co-circulating of dual lineages of influenza B viruses and ensures broader coverage, thereby improving the vaccine's efficacy in preventing influenza infection across a wider range of virus strains.

Market Size of Influenza Vaccines

The global influenza vaccine market increased from US$5.3 billion in 2019 to US$6.7 billion in 2023, at a CAGR of 5.9%, and is estimated to further increase to US$12.9 billion in 2032, at a CAGR of 7.6% from 2023 to 2032. The global subunit influenza vaccine market has gradually increased from US$0.4 billion in 2019 to US$0.6 billion in 2023, and it is estimated to further increase to US$1.4 billion by 2032. The influenza vaccine market in China has also grown significantly from RMB2.0 billion in 2019 to RMB8.8 billion in 2023, at a CAGR of 45.1%. The total number of lot release of influenza vaccines increased from 30.8 million in 2019 to 70.5 million in 2023. The influenza vaccine market in China is estimated to further increase to RMB19.8 billion in 2032, at a CAGR of 9.4% from 2023 to 2032. As the first quadrivalent subunit influenza vaccine, namely the Company's quadrivalent subunit influenza vaccine, was approved by the NMPA in 2023, the subunit influenza vaccine market in China is estimated to grow rapidly from RMB0.4 billion in 2023 to RMB3.4 billion in 2032, at a CAGR of 27.4%. The following chart sets forth the market size of influenza vaccines in China in terms of production value for the period indicated.

Influenza Vaccine Market in China, 2019-2032E

Period	CAGR			
	Subunit vaccine	Split-virion vaccine	Other technical routes	Total
2019-2023	–	42.2%	–	45.1%
2023-2032E	27.4%	7.6%	9.6%	9.4%



Note: Production value is calculated by multiplying the total number of lot release by the respective unit price of each vaccine.

Source: NIFDC, Frost & Sullivan analysis

The first quadrivalent influenza vaccine was approved by the NMPA in 2018. Since then, China's quadrivalent influenza vaccine market has grown significantly. The total number of lot release increased from 9.7 million in 2019 to 55.6 million in 2023, at a CAGR of 54.7%.

Competitive Landscape of Influenza Vaccines in China

As of the Latest Practicable Date, there were 19 marketed influenza vaccines in China, including 10 trivalent vaccines (including 8 split-virion vaccines, 1 subunit vaccine and 1 live attenuated vaccine) and 9 quadrivalent vaccines (including 8 split-virion vaccines and 1 subunit vaccine, namely the Company's quadrivalent subunit influenza vaccine). The following table sets forth details of the Company's quadrivalent subunit influenza vaccine and other marketed influenza vaccines in China as of the Latest Practicable Date.

Type	Brand Name (Generic Name)	Technical Route	Manufacturer	NMPA approval date*	Age Coverage
Trivalent	Anflu (安爾來福)	Split Virion	Sinovac (科興)	2007/01	6 months of age and older
	Influenza vaccine	Split Virion	Shanghai Institute of Biological Products (上海生物製品研究所)	2007/05	6 months of age and older
	YUGANNING (御感寧)	Split Virion	Toyouvax (天元生物)	2007/06	6 months of age and older
	適普利爾	Split Virion	Changchun Institute of Biological Products (長春生物製品研究所)	2007/07	6 months through 3 years of age
	Influenza vaccine	Split Virion	Hualan Biological Bacterin (華蘭生物)	2008/04	6 months of age and older
	Influenza vaccine	Split Virion	Fosun Apexvac (復星雅立峰)	2009/06	3 years of age and older
	FLU-K (孚洛克)	Subunit	Zhongyianke Biotech (中逸安科)	2010/04	3 years of age and older
	VAXIGRIP (凡爾靈)	Split Virion	Sanofi Pasteur Biological Products	2013/06	3 years of age and older; 6-35 months of age
	Influenza vaccine	Split Virion	Adimmune (國光生物)	2015/10	3 years of age and older
	感霧	Live Attenuated	BCHT (百克生物)	2020/02	3-17 years of age
Quadrivalent	Influenza vaccine, quadrivalent	Split Virion	Hualan Biological Bacterin (華蘭生物)	2018/06	3 years of age and older
				2022/1	6-35 months of age
	迪福賽爾	Split Virion	GDK (金迪克生物)	2019/05	3 years of age and older
	Influenza vaccine, quadrivalent	Split Virion	Changchun Institute of Biological Products (長春生物製品研究所)	2020/03	3 years of age and older
	Influenza vaccine, quadrivalent	Split Virion	Wuhan Institute of Biological Products (武漢生物製品研究所)	2020/04	3 years of age and older
	Influenza vaccine, quadrivalent	Split Virion	Sinovac (科興)	2020/06	3 years of age and older
	Influenza vaccine, quadrivalent	Split Virion	Shanghai Institute of Biological Products (上海生物製品研究所)	2021/03	6 months of age and older
	安定伏	Split Virion	Adimmune (國光生物)	2022/02	3 years of age and older
	VaxigripTetra 凡爾佳	Split Virion	Sanofi Pasteur Biological Products	2023/02	6 months of age and older
	慧爾康欣	Subunit	***the Company***	2023/05	3 years of age and older

Note: The approval date is the time when the vaccine was first approved, without considering age-group expansion.

Sources: NMPA, Frost & Sullivan

As of the Latest Practicable Date, there were 16 influenza vaccine candidates under clinical development in China, including 4 trivalent vaccines (including 2 split-virion vaccines, 1 live attenuated vaccine and 1 subunit vaccine, namely the Company's trivalent subunit influenza vaccine) and 12 quadrivalent vaccines (including 10 split-virion vaccines and 2 subunit vaccines). The following table sets forth details of the Company's trivalent subunit influenza vaccine candidate and other influenza vaccine candidates in China as of the Latest Practicable Date.

Type	Technical Route	Manufacturer	Clinical Stage	First Posted Date*	Age Coverage
Trivalent	Subunit	***the Company***	BLA	2024/9	3 years of age and older
			BLA	2024/10	6-35 months of age
	Live Attenuated	BCHT (百克生物)	BLA	2024/4	3-59 years of age
	Split Virion	ZFSW (智飛生物)	BLA	2024/10	3 years of age and older
			BLA	2024/11	6-35 months of age
	Split Virion	Peisen Biotechnology (培森生物)	I (completed)	2022/3	3 years of age and older
Quadrivalent	Subunit	***the Company***	BLA	2024/6	6-35 months of age
	Subunit	Changchun Institute of Biological Products (長春生物製品研究所)	I	2024/04	3 years of age and older
	Split Virion	CuroVax (康潤生物)	BLA	2024/3	3 years of age and older
			I	2024/4	6-35 months of age
	Split Virion	Toyouvax (天元生物)	BLA	2023/12	3 years of age and older
			I	2024/3	6 months of age and older
	Split Virion	ZFSW (智飛生物)	BLA	2024/9	6-35 months of age
	Split Virion	Wuhan Institute of Biological Products (武漢生物製品研究所)	BLA	2024/11	3 years of age and older
	Split Virion	BioKangtai (康泰生物)	BLA	2024/11	3 years of age and older
	Split Virion	Chengda Biotechnology (成大生物)	III	2020/12	3 years of age and older
	Split Virion	Sinovac (科興)	III	2023/9	6-35 months of age
	Split Virion	Fosun Apexvac (復星雅立峰)	III	2023/10	6-35 months of age
	Split Virion	Walvax (沃森生物)	III	2024/10	3 years of age and older
	Split Virion	Hygiea Biotech (海基亞生物)	I	2020/10	6-35 months of age; 3 years of age and older

Note: The dates for products in BLA stage are the dates handled by the CDE.

Sources: CDE, Frost & Sullivan

Competitive Landscape of Influenza Vaccines Outside China

As of the Latest Practicable Date, there were 22 influenza vaccines approved by the FDA, including 12 trivalent vaccines (including 6 split-virion vaccines, 4 inactivated subunit vaccine, 1 recombinant subunit vaccine and 1 live attenuated vaccine) and 10 quadrivalent vaccines (including 6 split-virion vaccines and 2 inactivated subunit vaccine, 1 recombinant subunit vaccine and 1 live attenuated vaccine). The following table sets forth details of the influenza vaccines approved by the FDA as of the Latest Practicable Date.

Type	Brand Name (Generic Name)	Technical Route	Manufacturer	FDA approval date*	Age Coverage
Trivalent	FLUVIRIN	Inactivated, Subunit	Seqirus	1988	4 years of age and older
	AFLURIA	Split Virion		2007/09	6 month of age and older
	Agriflu	Inactivated, Subunit		2009/11	18 years of age and older
	Flucelvax	Inactivated, Subunit		2012/11	6 month of age and older
	FLUAD	Inactivated, Subunit		2015/11	65 years of age and older
	Fluzone	Split Virion	Sanofi	1980	6 month of age and older
	Fluzone High-Dose	Split Virion		2009/12	65 years of age and older
	Fluzone Intradermal	Split Virion		2011/05	18-64 years of age
	Flublok	Recombinant, Subunit		2013/01	18 years of age and older
	Fluarix	Split Virion	GSK	2005/08	6 month of age and older
	FluLaval	Split Virion		2006/10	6 month of age and older
	FluMist	Live Attenuated	AZ	2003/06	2-49 years of age
Quadrivalent	Flucelvax Quadrivalent	Inactivated, Subunit	Seqirus	2016/05	6 month of age and older
	Afluria Quadrivalent	Split Virion		2017/07	6 month of age and older
	Fluad Quadrivalent	Inactivated, Subunit		2020/02	65 years of age and older
	Fluzone Quadrivalent	Split Virion	Sanofi	2013/6	6 month of age and older
	Fluzone Intradermal Quadrivalent	Split Virion		2014/12	18-64 years of age
	Flublok Quadrivalent	Recombinant, Subunit		2016/10	18 years of age and older
	Fluzone High-Dose Quadrivalent	Split Virion		2019/11	65 years of age and older
	Fluarix Quadrivalent	Split Virion	GSK	2012/11	6 month of age and older
	Flulaval Quadrivalent	Split Virion		2013/08	6 month of age and older
	FluMist Quadrivalent	Live Attenuated	AZ	2013/07	2-49 years of age

Note: The approval date is the time when the vaccine was first approved, without considering age-group expansion.

Sources: FDA, Frost & Sullivan

As of the Latest Practicable Date, there were 12 influenza vaccine candidates under clinical development outside China, primarily including 2 trivalent mRNA vaccines and 6 quadrivalent vaccines (primarily including 4 mRNA vaccines). The following table sets forth details of influenza vaccine candidates outside China as of the Latest Practicable Date.

Type	Generic Name	Technical Route	Manufacturer	Clinical Stage	First Posted Date	Age Coverage	Location
Trivalent	GSK4382276A	mRNA	GSK	II	2024/05	18 years of age and older	US
	PF-07845104	mRNA	Pfizer	I/II	2024/05	18 years of age and older	US
Quadrivalent	mRNA-1010	mRNA	Moderna	III	2024/09	50 years of age and older	Global
	mRNA-1020			I/II	2022/04	18 years of age and older	US
	mRNA-1030			I/II	2022/04	18 years of age and older	US
	SP0237	mRNA	Sanofi	II	2024/04	18 years of age and older	US, Puerto Rico, Honduras
	OVX836	Non-VLP Nanoparticles	Osivax	II	2024/09	20-69 years of age	Belgium
	KBP-V001	Recombinant	KBio	I	2020/06	18-49 years of age	US
Pentavalent	mRNA-1011	mRNA	Moderna	I/II	2023/03	50-75 years of age	US
Hexavalent	mRNA-1012	mRNA	Moderna	I/II	2023/03	50-75 years of age	US
	–	mRNA	Sanofi	I/II	2020/12	50 years of age and older	N/A
Not Disclosed	UFluA	Non-VLP Nanoparticles	Emergent BioSolutions	I	2021/12	18-45 years of age	Australia

Sources: ClinicalTrials.gov, Frost & Sullivan

Market Drivers and Future Trends

The primary drivers and future trends of influenza vaccine market in China include:

- *Increased market demand.* Influenza affects individuals of all ages, especially infants, children and the elderly, necessitating widespread immunization. The China CDC advises annual vaccinations for all individuals aged six months and above who are willing and have no contraindications. The target population for influenza vaccines is huge and the market demand is high. As the immune protection generated by influenza decrease over time and the frequent emergence of influenza virus mutations may result in mismatch between the vaccine strain and the prevalent virus strain, it is necessary to receive annual vaccination for best protection. China CDC also recommends vaccination of one to two doses to generate a sufficient amount of antibodies. The annual and multi dose vaccination of influenza vaccines has expanded market demand for vaccines and driven market development.

- *Favorable policies.* Though influenza vaccines are not included in China's national immunization program, several regions have initiated free vaccination schemes for certain demographics, boosting public vaccination rates. For instance, Beijing offers free vaccines to residents over 60, students and other key groups, while Zhejiang and Shenzhen have similar initiatives that offer free vaccines to the elderly. These policies increase public willingness to vaccinate, promoting market growth.

- *Increased vaccine coverage.* Referencing a vaccination coverage rate of 49.3% in all people aged 6 months and older in the U.S. during the 2022-2023 season compared to an overall vaccination coverage rate of 3.8% in China for the same year, there is considerable room for improvement in China. With favorable policies that offer free vaccinations and people's increased ability to pay, the coverage of influenza vaccines in China will continue to increase, narrowing the gap with developed countries.

- *Pediatric and elderly markets.* Vulnerable to severe influenza symptoms, infants, young children and the elderly are key demographics for vaccine expansion. Ongoing promotion and introduction of vaccines for these groups are expected to drive growth. Policy-backed free vaccination for these populations is also anticipated to significantly boost penetration rates.

- *Vaccine diversification.* The approval of the Company's quadrivalent subunit influenza vaccine, which is the first marketed quadrivalent subunit influenza vaccine in China, in May 2023 represents a significant advancement, addressing a domestic gap with its high safety and targeted protection. Inspired by mRNA COVID-19 vaccine successes, there has been a notable increase in investment in developing mRNA vaccines and other diverse vaccine types, providing more choices, better protection with enhanced safety to target populations, and thus boosting market adoption.

HUMAN RABIES VACCINES

Overview of Rabies

Rabies is an acute zoonotic infectious disease that primarily affects the central nervous system, caused by the rabies virus, which usually enters the human body through bites by infected animals. In its advanced stages, rabies can manifest as either "furious" or "paralytic" forms. Furious rabies is marked by confusion, involuntary body responses like pupil dilation and excessive saliva production and intense throat spasms. Paralytic rabies involves progressive paralysis, limb weakness and sensory impairment. Rabies is almost always fatal once symptoms show. The incubation period of the rabies virus typically lasts from one to three months. After seizure, it usually causes death within seven to ten days. Accordingly, rabies vaccines are crucial in preventing infection caused by the rabies virus after exposure. The human rabies vaccine can cause the human body to produce antibodies against the rabies virus and thus prevent infections.

The UK Department of Public Health has conducted an assessment of post-exposure risk of rabies globally. The assessment indicates that while contact with primates and rodents generally poses a low rabies risk worldwide, all regions, except United Kingdom and Ireland, are considered high-risk for exposure through bats. Additionally, regions across Asia, Africa, South America and Central America, including China, are classified as high-risk for rabies exposure from land-based animals. In developing countries, rabies poses a significant public health challenge, with developing countries in Asia and Africa accounting for over 95% of global human rabies deaths. The high incidence and mortality rates necessitate immediate post-exposure vaccination as a primary control measure. Conversely, in developed countries, rabies case is seldomly reported due to robust animal disease control systems, primarily involving comprehensive preventive vaccinations for pets. Consequently, the demand for rabies vaccines in these areas remains driven largely by prevention rather than active outbreaks. This delineates a dual focus within the global rabies vaccine industry where developing countries prioritize human vaccines for immediate post-exposure needs, while developed nations emphasize animal vaccinations to maintain low disease incidence.

Although rabies is a highly dangerous disease with no effective treatment once symptoms have appeared, it can be prevented if a vaccine is administered immediately after exposure to the virus. The China CDC recommends urgent post-exposure measures, such as rabies vaccination, following any bites or scratches from high-risk animals, including dogs, cats and wild mammals like bats. This necessity has led to a substantial demand for rabies vaccines in China. Driven by the increased public awareness about the importance of human rabies vaccination and stricter control over animal populations, the incidence of rabies infection in China has been decreasing over the years. According to the Statistical Report on China's Health Care Development, there were 122 new cases, including 111 deaths, related to rabies in China in 2023.

As explained above, post-exposure vaccination is crucial for anyone potentially exposed to rabies through animal bites or saliva exposure. Depending on the contact with infected animals, individuals are subject to different exposure risks. For individuals with mild exposure level, such as minor scratches without bleeding or licks on broken skin, wound treatment and rabies vaccinations are required. For individuals with severe exposure level, such as transdermal bites or scratches, licks on open wounds or exposure to bats, administration of rabies immunoglobulin are required in addition to wound treatment and rabies vaccinations. In addition, pre-exposure rabies vaccinations are recommended for individuals frequently exposed to environments with a rabies risk. For those at high risk of rabies exposure due to their occupation, such as laboratory workers handling rabies virus or veterinarians, regular booster vaccinations are recommended, especially if their serum antibody levels decline below a protective threshold.

Overview of Human Rabies Vaccines

Currently marketed human rabies vaccines in China can be categorized into the following types based on the manufacturing technology route under which the rabies virus strain is cultured.

- *Primary cell rabies vaccines.* Traditionally used in rabies vaccine production, primary cells, such as primary chicken embryo cells and primary hamster kidney cells, are cultured through traditional adherent cell culture processes. Despite their lower production costs, these cells come with higher risks of contamination and face limitations in large-scale manufacturing, making them less competitive compared to more modern methods like Vero cells.

- *Vero cell rabies vaccines.* These are seen as an innovative cell line with significant advantages over traditional methods. Vero cells are derived from the kidney cells of the African green monkey. With bioreactor technology, Vero cells can be cultivated in suspension culture, which ensures higher culture efficiency. This leads to improved production quality and lowers the risk of contamination by external pathogens.

- *Human diploid cell rabies vaccines.* A human diploid cell is a cell that is isolated from human tissues and cultured *in vitro*. These cells contains two complete sets of chromosomes, one set from each biological parent. These cells face challenges in scaling up production due to highly sophisticated and stringent technical standards required for extraction and cultivation. Consequently, these requirements result in higher production costs compared to other cell lines, making the large-scale vaccine manufacturing of such vaccines more challenging. However, as human diploid cell vaccines do not contain any potential tumor-causing DNA residues or risk of foreign protein allergens, they are theoretically safer than primary cell and Vero cell vaccines. The WHO also recommends human diploid cells as one of the safest cell substrates for the production of viral vaccines. Although there are currently only two

marketed human diploid cell rabies vaccines, the production of human diploid cell rabies vaccines is expected to increase in the next two to three years and human diploid cell rabies vaccines are expected to become one of the mainstream vaccines in the human rabies vaccine market.

Human rabies vaccines can be administered through different schedules, including the Essen regimen, Zagreb regimen and "1-1-1-1" regimen. The Essen regimen is a five-dose regimen where one dose is administered on each of days 0, 3, 7, 14 and 28. The "1-1-1-1" regimen, also known as the simplified four doses regimen, modifies the Essen regimen by eliminating the final dose. In the "1-1-1-1" regimen, vaccinations are administered on days 0, 3, 7 and between days 14 and 28, resulting in a total of four doses. The Zagreb regimen is specifically applicable for certain rabies vaccines approved in China. It consists of two initial doses administered on day 0, one in each of the arms, followed by additional doses on days 7 and 21.

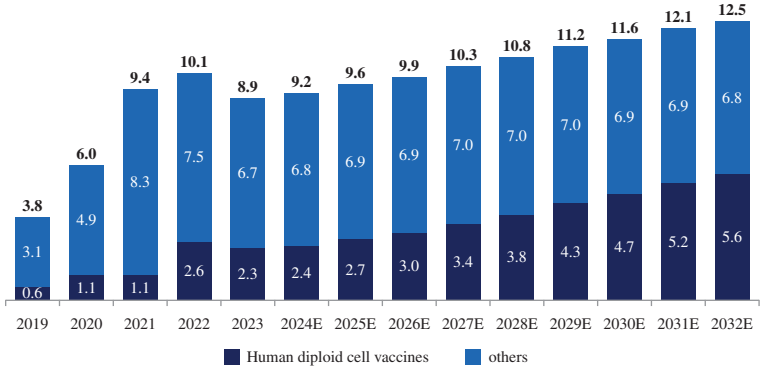
Market Size of Human Rabies Vaccines

The human rabies vaccine market in China, in terms of production value, increased from RMB3.8 billion in 2019 to RMB8.9 billion in 2023, at a CAGR of 23.9%. The total number of lot release increased from 58.8 million in 2019 to 70.4 million in 2023. Driven by increase in vaccination rates and the introduction of high-value human rabies vaccines, the human rabies vaccine market in China is estimated to further increase to RMB12.5 billion in 2032, at a CAGR of 3.8% from 2023 to 2032. With the introduction of human rabies vaccines developed from human diploid cells, the advanced formulation is anticipated to partly replace traditional vaccines manufactured with Vero and primary hamster kidney cell, leading to an increase in the unit price of human rabies vaccines. The following chart sets forth the market size of human rabies vaccines in China in terms of production value for the period indicated.

Human Rabies Vaccine Market in China, 2019-2032E

Period	CAGR		
	HDCV	Others	Total
2019-2023	37.2%	20.6%	23.9%
2023-2032E	10.8%	0.3%	3.8%

Unit: Billion RMB



Note: Production value is calculated by multiplying the total number of lot release by the respective unit price of each vaccine.

Sources: NIFDC, Frost & Sullivan analysis

Competitive Landscape of Human Rabies Vaccines in China

As of the Latest Practicable Date, there were 23 marketed human rabies vaccines in China, including 15 vaccines developed from Vero cells (including 11 lyophilized vaccines), 6 vaccines developed from hamster kidney cells (including 2 lyophilized vaccines) and 2 vaccines developed from human diploid cells, both of which are lyophilized. The following table sets forth details of marketed rabies vaccines in China as of the Latest Practicable Date.

Cell Line	Brand Name (Generic Name)	Manufacturer	NMPA approval date	Immunization Schedule
Human diploid cell (lyophilized)	–	Kanghua Biological Products (康華生物)	2012/01	Essen 5 doses
	–	Minhai (民海生物)	2023/09	Zagreb 4 doses & Essen 5 doses
Vero cell	武生旺寧	Wuhan Institute of Biological Products (武漢生物製品研究所)	2004/01	Essen 5 doses
	–	Chengda Biotechnology (成大生物)	2004/01	Zagreb 4 doses & Essen 5 doses
	–	HK Biotech (惠康生物)	2006/11	Essen 5 doses
	–	Fosun Apexvac (復星雅立峰)	2016/09	Essen 5 doses
Vero cell (lyophilized)	–	Yisheng Biopharma (依生生物)	2003/04	Essen 5 doses
	–	Chengda Biotechnology (成大生物)	2004/01	Zagreb 4 doses & Essen 5 doses
	武生欣寧	Wuhan Institute of Biological Products (武漢生物製品研究所)	2005/01	Essen 5 doses
	–	Rongan Biotech (榮安生物)	2007/01	Essen 5 doses
	–	Promise Biological (諾誠生物)	2008/01	Essen 5 doses
	–	Zhuoyi Biological (卓誼生物)	2016/11	Essen 5 doses
	–	Changchun Institute of Biological Products (長春生物製品研究所)	2021/04	Zagreb 4 doses & Essen 5 doses
	–	Yidu Biotechnology (亦度生物)	2021/07	Zagreb 4 doses & Essen 5 doses
	–	Hualan Biological Bacterin (華蘭生物)	2023/04	Zagreb 4 doses & Essen 5 doses
	–	CuroVax (康潤生物)	2023/09	Zagreb 4 doses & Essen 5 doses
	–	Fosun Apexvac (復星雅立峰)	2024/03	Essen 5 doses
Hamster kidney cell	–	Yatai Biopharmaceuticals (亞泰生物)	1999/01	Essen 5 doses
	–	CGE Healthcare (遠大生物)	2000/01	Essen 5 doses
	–	Lanzhou Institute of Biological Products (蘭州生物製品研究所)	2000/01	Essen 5 doses
	–	Zhongke Biotic (中科生物)	2000/02	Essen 5 doses
	–	AIM (艾美疫苗)	2006/01	Essen 5 doses
Hamster kidney cell (lyophilized)	–	Lanzhou Institute of Biological Products (蘭州生物製品研究所)	2005/01	Essen 5 doses

Sources: NMPA, Frost & Sullivan

As of the Latest Practicable Date, there were 19 human rabies vaccine candidates under clinical development in China, primarily including 11 vaccines developed from Vero cells and 6 vaccines developed from human diploid cells (including the Company's rabies vaccine candidate). The following table sets forth details of the Company's rabies vaccine candidate and other rabies vaccine candidates in China as of the Latest Practicable Date.

Cell Line	Manufacturer	Clinical Stage	First Posted Date*	Immunization Schedule
Human diploid cell	Minhai (民海生物)	BLA	2015/09	Essen 5 doses
	Chengda Biotechnology (成大生物)	BLA	2024/08	Zagreb 4 doses & Essen 5 doses & 1-1-1-1
	ZFSW (智飛生物)	BLA	2024/10	Zagreb 4 doses & Essen 5 doses
	Chengdu Institute of Biological Products (成都生物製品研究所)	III	2017/05	Zagreb 4 doses & Essen 5 doses
	Prokang Biotechnology (普康生物)	III	2024/07	Zagreb 4 doses & Essen 5 doses
	the Company	I (completed)	2023/11	Zagreb 4 doses & Essen 5 doses
Vero cell	Nuocheng Biological Products (諾辰生物)	BLA	2024/07	Zagreb 4 doses & Essen 5 doses
	GDK (金迪克生物)	III (completed)	2017/12	Essen 5 doses
	Maokangyuan Biotechnology (茂康源生物)	III	2019/12	Essen 5 doses
	ZFSW (智飛生物)	III	2020/12	Zagreb 4 doses & Essen 5 doses
	Chengda Biotechnology (成大生物)	III (completed)	2021/07	1-1-1-1
	BoaoVax (柏奧特克生物)	III (completed)	2021/08	1-1-1-1 & Essen 5 doses
	Ronsen (榮盛生物)	III	2022/06	Essen 5 doses
	RBSPH (銀河陽光生物製品)	III	2022/11	1-1-1-1 & Essen 5 doses
	Ningbo Rongan Biological (榮安生物藥業)	III	2023/07	Essen 5 doses
	Yisheng Biopharmaceutical (依生生物)	III	2024/11	1-1-1-1 & Zagreb 4 dose
	Yatai Biological Pharmaceutical (亞泰生物藥業)	I (completed)	2021/02	Essen 5 doses
Chicken embryo cell	King-cell Biotechnology (青賽生物)	BLA	2024/10	Zagreb 4 doses & Essen 5 doses
	Qingfeng/C-Fusion Biotechnology (青峰藥業/賽爾富森生物科技)	III	2022/01	Zagreb 4 doses & Essen 5 doses

Note: The dates for products in BLA stage are the dates handled by the CDE.

Sources: CDE, Frost & Sullivan

Market Drivers and Future Trends

The primary drivers and future trends of human rabies vaccine market include:

- *Increase in pet ownership*. The number of pet owners in China is rising, with a significant increase in pet dogs. Social and demographic changes, along with better living standards, contribute to this growth. According to WHO's World Health Statistics reports, over 95.0% of human rabies cases worldwide are caused by dog-related injuries. Unlike developed nations, China has not yet effectively implemented widespread animal vaccination programs, leading to higher demand for human rabies vaccines.

- *Affordability and awareness*. Higher per capita disposable income enables more people to afford self-funded vaccines like human rabies vaccines. Improved education and experiences from the COVID-19 pandemic have also heightened awareness of infectious disease risks and vaccination importance, leading to increased focus on disease prevention and management.

- *Growth in Human Diploid Cell Rabies Vaccine Market Share*. The human rabies vaccine developed from human diploid cell is the WHO's gold standard for rabies vaccines, offering higher safety and stronger immune responses. While the current price of such vaccines, which is much higher than other human rabies vaccines, impacts vaccination rates, technological advancements may reduce production costs, improving affordability. With economic growth, the market share of human diploid cell rabies vaccines is anticipated to rise.

PNEUMOCOCCAL VACCINE

Overview of Pneumococcal Disease

Pneumococcal diseases are caused by *Streptococcus pneumonia*, a pneumococcus bacteria. Pneumococcal diseases can be divided into invasive pneumococcal diseases (IPD) and non-invasive pneumococcal diseases (NIPD). NIPD occurs when pneumococcus bacteria infect areas outside the major organs or bloodstream, such as the upper and lower respiratory tracts. These infections can lead to conditions like otitis media (infection of the middle ear), bronchitis (inflammation of the bronchial tubes) and nasosinusitis (infection and inflammation of the nasal passages and sinuses). In contrast, IPDs are more severe, as the bacteria invade major organs or the bloodstream. This can result in serious conditions such as bacteremia (the presence of bacteria in the blood), sepsis (a life-threatening response to infection causing systemic inflammation), meningitis (infection of the protective membranes covering the brain and spinal cord), pneumonia, osteomyelitis (infection of the bone) and septic arthritis (infection of a joint). IPD has a notably high mortality rates in children, particularly in low- and middle-income countries, where the mortality rate for sepsis associated with IPD can reach up to 20%, while that for meningitis can be as high as 50%. In 2019, there were 0.8 million new cases of pneumococcal diseases in China. Due to increased health awareness among residents, enhanced government immunization efforts and the commercial production and sales of domestic pneumococcal vaccines, the incidence rate of pneumococcal diseases has gradually decreased in recent years, with 0.7 million new cases in China in 2023. While pneumococcal diseases can affect all age groups, high risk populations are those with relatively weaker immune systems, including the young children and the elderly. In addition, antibiotic resistance caused by the wide misuse of antibiotics has exacerbated morbidity and mortality among the elderly infected with pneumococcal diseases.

Currently, antibiotic therapy is the first choice for treatment of pneumococcal disease. However, *Streptococcus pneumonia* has shown significant resistance to many commonly prescribed antibiotics. The introduction of pneumococcal vaccinations has successfully decreased the prevalence of resistant strains in certain developed areas. However, resistance remains a significant issue in many Asian countries due to extensive antibiotic use and low vaccine coverage. Hence, preventive measures, especially the use of vaccines, are increasingly necessary. Pneumococcal vaccines, particularly conjugate vaccines, have proven effective in preventing pneumococcal diseases, especially in children. However, pneumococcal vaccines have a low vaccination rate of approximately 9% in China in terms of the total population, compared to over 90% in the United States.

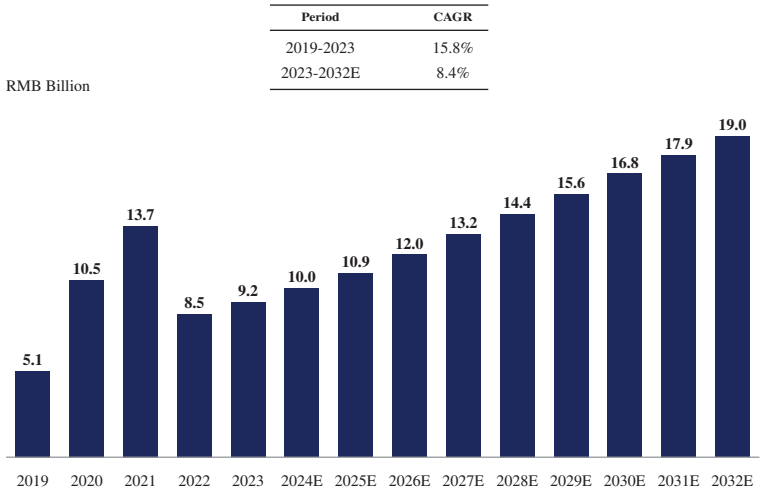
Overview of Pneumococcal Vaccines

Pneumococcal vaccines can be classified into several types, among which polysaccharide vaccines and conjugate vaccines are the most commonly used for different age groups and different pneumococcal serotypes. 23-valent pneumococcal polysaccharide vaccines (PPSV23) and 13-valent pneumococcal conjugate vaccines (PCV13) are the only two types of pneumococcal vaccines currently sold in China. Currently, PCV13 are used in infants and children and PPSV23 are used in people aged 50 years and above or people over 2 years old with increased infection risks. In contrast, a number of pneumococcal vaccines are available outside China, including 7-valent pneumococcal conjugate vaccines (PCV7), 10-valent pneumococcal conjugate vaccines (PCV10), PCV13, 15-valent pneumococcal conjugate vaccines (PCV15), 20-valent pneumococcal conjugate vaccines (PCV20) and PPSV23. PCV7 and PCV10 are currently used in children while PCV15 and PCV20 are currently used in children and adults.

Market Size of Pneumococcal Vaccines

The pneumococcal vaccine market in China, in terms of production value increased from RMB5.1 billion in 2019 to RMB9.2 billion in 2023, at a CAGR of 15.8%. The total number of lot release increased from 14.2 million in 2019 to 21.4 million in 2023. It is expected to further increase to RMB19.0 billion in 2032, at a CAGR of 8.4% from 2023 to 2032. The following chart sets forth the market size of pneumococcal vaccines in China in terms of production value for the period indicated.

Pneumococcal Vaccine Market in China, 2019-2032E



Note: Production value is calculated by multiplying the total number of lot release by the respective unit price of each vaccine.

Sources: NIFDC, Frost & Sullivan analysis

The PPSV23 market in China, in terms of production value, was RMB1.8 billion in 2019. Driven by the increase awareness of pneumonia awareness after the COVID outbreak in 2020, the PPSV23 market significantly increased to RMB3.4 billion in 2020, with the total number of lot release of PPSV23 vaccine also increased from 9.5 million in 2019 to 17.4 million in 2020. However, after the marketing of COVID-19 vaccines in 2021, the market size and lot release of PPSV23 have declined, remaining at approximately the same level as in 2019. The market of PPSV23 in China decreased to RMB1.9 billion in 2023 and the total number of lot release decreased to 8.8 million in 2023. However, with the increased availability more advanced products in China, the PPSV23 market in China is expected to grow in the next few years, reaching RMB5.5 billion in 2032, at a CAGR of 12.9% from 2023 to 2032.

Competitive Landscape of Pneumococcal Vaccines in China

As of the Latest Practicable Date, there were nine marketed pneumococcal vaccines in China, including six PPSV23 and three PCV13. The following table sets forth details of marketed pneumococcal vaccines in China as of the Latest Practicable Date.

Type	Brand Name (Generic Name)	Technical Route	Manufacturer	NMPA approval date*	Age Coverage
23-valent	PNEUMOVAX (紐莫法)	Polysaccharide	MSD	2010/02	50 years of age and older; 2 years of age and older who are at increased risk
	沃朵菲		Walvax (沃森生物)	2017/03	2 years of age and older who are at increased risk
	維民菲樂		Minhai (民海生物)	2018/08	2 years of age and older who are at increased risk
	惠益康		Chengdu Institute of Biological Products (成都生物製品研究所)	2020/07	2 years of age and older who are at increased risk
	23-valent Pneumococcal Polysaccharide Vaccine		Sinovac (科興)	2020/12	2 years of age and older who are at increased risk
	優威克		ZFSW (智飛生物)	2023/08	2 years of age and older who are at increased risk
13-valent	Prevnar 13	Polysaccharide Conjugate	Pfizer	2016/10	6 weeks through 5 years of age
	維民菲寶		Minhai (民海生物)	2021/09	6 weeks through 5 years of age
	Weuphoria (沃安心13)		Walvax (沃森生物)	2019/12	6 weeks through 5 years of age

Note: The approval date is the time when the vaccine was first approved, without considering age-group expansion.

Sources: NMPA, Frost & Sullivan

As of the Latest Practicable Date, there were 20 pneumococcal vaccine candidates under clinical development in China, primarily including 9 PCV13, 4 PCV24 and 3 PPSV23 (including the Company's PPSV23). The following table sets forth details of the Company's PPSV23 candidate and other pneumococcal vaccine candidates in China as of the Latest Practicable Date.

Type	Technical Route	Manufacturer	Clinical Stage	First Posted Date*	Age Coverage
23-valent	Polysaccharide	Lanzhou Institute of biological products (蘭州生物製品研究所)	III (completed)	2015/12	2 years of age and older
		AIM (艾美疫苗)	III	2023/8	2 years of age and older
		the Company	I (completed)	2020/9	2 years of age and older
13-valent	Polysaccharide Conjugate	Lanzhou Institute of Biological Products (蘭州生物製品研究所)	BLA	2023/03	2 months through 5 years of age (at least 6 weeks of age)
		CanSino (康希諾)	III	2021/4	7 months through 5 years of age
			III	2021/4	6 weeks through 3 months of age
			BLA	2024/02	*The age for submitting BLA for this product has not been disclosed
		AIM (艾美疫苗)	BLA	2024/11	2 months through 5 years of age (at least 6 weeks of age)
		Fosun Adgenvax (復興安特金)	III	2022/5	2-3 months of age (at least 6 weeks of age)
		Sinovac (科興)	III	2023/10	2 months through 5 years of age (at least 6 weeks of age)
		Kunli Biopharmaceutical (坤力生物)	I	2021/7	2 months through 59 years of age (at least 6 weeks of age)
		Microvac Biotech (微超生物)	I	2022/3	2 months through 49 years of age (at least 6 weeks of age)
		BravoVax, Chengda (博沃生物，遼寧成大)	I	2022/10	2 months of age and older (at least 6 weeks of age)
		Chengdu Institute of Biological Products (成都生物製品研究所)	I	2023/3	2 months through 59 years of age (at least 6 weeks of age)
24-valent	Polysaccharide Conjugate	ZFSW (智飛生物)	III	2020/12	2-3 months of age (at least 6 weeks of age)
		Reinovax (瑞宙生物)	II	2024/4	18 years of age and older
			I	2024/4	6 weeks through 5 years of age
		Kunli Biopharmaceutical (坤力生物)	I/II	2022/2	65 years of age and older
		Sinovac (科興)	I	2024/8	2-17 years of age
			I	2024/6	18 years of age and older
15-valent	Polysaccharide Conjugate	ZFSW (智飛生物)	I/II	2024/8	2 months of age and older (at least 6 weeks of age)
26-valent	Polysaccharide Conjugate	Microvac Biotech (微超生物)	I	2023/4	2 months through 55 years of age (at least 6 weeks of age)
20-valent	Polysaccharide Conjugate	Innovax Biotech (萬泰滄海生物)	I	3023/3	6 weeks of age and older
	Polysaccharide Conjugate	Minhai (民海生物)	I	2024/11	2 months through 59 years of age

Note: The dates for products in BLA stage are the dates handled by the CDE.

Sources: CDE, Frost & Sullivan

Market Drivers and Future Trends

The primary drivers and future trends of pneumococcal vaccine market in China include:

- *Increased risk among the elderly*. With advancing age, the susceptibility to pneumococcal disease rises, particularly among individuals aged 65 and above. China's population in this age group reached 216.8 million in 2023, and it is estimated to increase to 286.0 million by 2032. Coupled with a growing trend of population aging and rising per-capita disposable income, the demand for pneumococcal vaccines, especially PPSV23, is anticipated to increase, leading to an expansion of the market size.

- *Rising vaccination rates*. Pneumococcal vaccination rates are still low in many regions of China as such vaccines are not covered by the national immunization program. The serious health impact of pneumococcus bacteria has led to WHO recommending inclusion of PCV in immunization schedules and the U.S. CDC recommending public vaccination. As health awareness grows among the Chinese population, the demand for preventive healthcare services, including pneumococcal vaccines, is expected to rise, consequently expanding the pneumococcal vaccine market in China.

- *Expansion of serotype coverage*. Multivalent pneumococcal vaccines address a broader array of pneumococcal serotypes and higher valent vaccines can prevent more pneumococcal serotypes and thus have better preventive effects. PCV7 has been gradually replaced by PCV13. Meanwhile, PCV24 is being developed and some PCV24 candidates have entered the clinical stage. The serotype coverage will likely expand further with the continuous development of new pneumococcal vaccines.

- *Increase in domestic production*. Before 2019, Pfizer's Prevnar 13 was the only available PCV13 globally. However, the launch of a domestically developed PCV13 in China in 2020 marked the end of Pfizer's market monopoly, bolstered by supportive national policies and an influx of advanced technology from overseas companies. Currently, there are two domestically developed PCV13 and five PPSV23 in China, and the number of domestically developed pneumococcal vaccines is expected to gradually increase in the future.

- *Widening scope of vaccine application*. The PCV13 currently under development in China has broadened their applicability to a larger population. Clinical trials have examined safety and efficacy in individuals from 2 months to 59 years. Meanwhile, the PCV24 under development targets those aged 18 years and above. As expertise accumulates through trials, the applicability of pneumococcal vaccines is expected to expand.

ZOSTER VACCINES

Overview

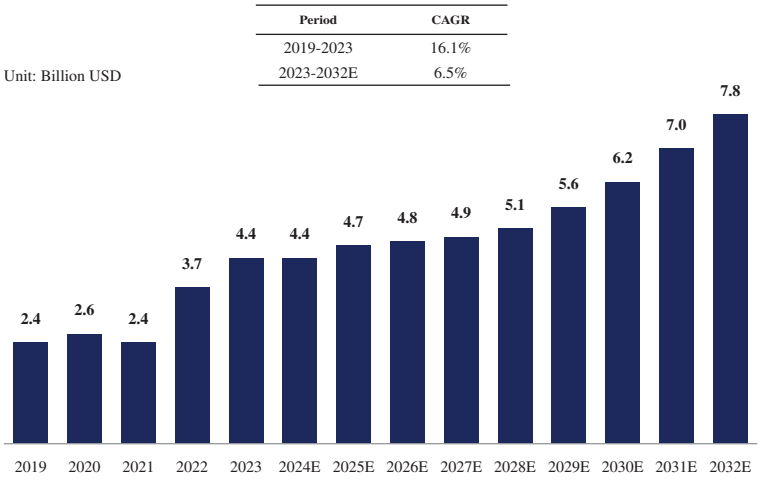
Herpes zoster, also known as shingles, is a medical condition caused by the reactivation of the varicella-zoster virus (VZV) that remains dormant in the body. VZV is the same virus responsible for chickenpox. This reactivation typically occurs when an individual's immunity to VZV diminishes due to factors such as aging or immunosuppression. While herpes zoster can manifest at any age, it predominantly affects the elderly. The disease is characterized by symptoms including pain, a general sense of malaise, fever, chills, muscle aches, headache, itching, numbness and a distinctive rash. Notably, VZV can be transmitted from an individual with active shingles to someone who has neither had chickenpox nor received a zoster vaccine. Following recovery from herpes zoster, the virus can remain inactive within the dorsal root and cranial nerve ganglia for extended periods, potentially for decades. The incidence of herpes zoster in China increased from 7.0 million in 2019 to 7.7 million in 2023. The global incidence of herpes zoster also increased from 31.0 million in 2019 to 40.8 million in 2023.

Currently available zoster vaccines include live attenuated vaccines and recombinant vaccines. The live attenuated zoster vaccine can enhance VZV-specific cell-mediated immunity in elderly individuals. However, its efficacy diminishes with increasing age and significantly diminishes after six to eight years post-vaccination. In contrast, the recombinant zoster vaccine demonstrates superior efficacy in elderly individuals and remains robust irrespective of the age of the vaccinee, with immune response persisting six to nine years after vaccination. This improved performance is attributable to the stronger immune response elicited by the current marketed recombinant zoster vaccine.

Market Size of Zoster Vaccines

The global zoster vaccine market increased from US$2.4 billion in 2019 to US$4.4 billion in 2023, at a CAGR of 16.1%, and is estimated to reach US$7.8 billion in 2032, at a CAGR of 6.5% from 2023 to 2032. The following chart sets forth the global market size of zoster vaccines in terms of sales revenue for the period indicated.

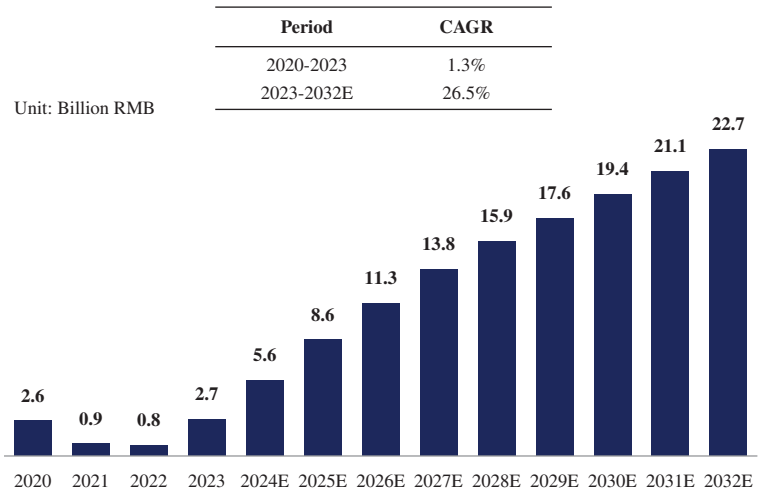
Global Zoster Vaccine Market, 2019-2032E



Sources: Annual reports of relevant companies, Frost & Sullivan analysis

The zoster vaccine market in China reached RMB2.6 billion in terms of production value in 2020 after the first zoster vaccine obtained approval from the NMPA in 2019. Driven by growing awareness of herpes zoster and the increasing number of available zoster vaccine products, the zoster vaccine market is estimated to increase from RMB2.7 billion in 2023 to RMB22.7 billion in 2032, at a CAGR of 26.5%. The following chart sets forth the market size of zoster vaccines in China in terms of production value for the period indicated.

Zoster Vaccine Market in China, 2020-2032E



Note: Production value is calculated by multiplying the total number of lot release by the respective unit price of each vaccine.

Sources: NIFDC, Frost & Sullivan analysis

Competitive Landscape of Zoster Vaccines in China

As of the Latest Practicable Date, there were two marketed zoster vaccines in China, including one recombinant vaccine and one live attenuated vaccine. The following table sets forth details of the marketed zoster vaccines in China as of the Latest Practicable Date.

Brand Name (Generic Name)	Technical Route	Manufacturer	NMPA approval date*	Age Coverage
SHINGRIX	Recombinant	GSK	2019/05	50 years of age and older
感維	Live Attenuated	BCHT (百克生物)	2023/01	40 years of age and older

Note: The approval date is the time when the vaccine was first approved, without considering age-group expansion.

Sources: NMPA, Frost & Sullivan

As of the Latest Practicable Date, there were nine zoster vaccine candidates under clinical development in China, including seven recombinant vaccines and two live attenuated vaccines. The following table sets forth details of the Company's recombinant zoster vaccine candidate (CHO cell) and other zoster vaccine candidates in China as of the Latest Practicable Date.

Technical Route	Manufacturer	Clinical Stage	First Posted Date	Age Coverage
Recombinant	Recbio (瑞科生物)	III	2024/10	40 years of age and older
Recombinant	Lvzhu Biotech (綠竹生物)	III	2023/9	40 years of age and older
		II	2024/11	50 years of age and older
Recombinant	MaxVax (邁科康生物)	III	2024/6	40 years of age and older
		II	2023/5	30 years of age and older
		I	2022/10	18 years of age and older
Recombinant	Varnotech (華諾泰生物)	II	2024/10	40 years of age and older
Recombinant	CGE Healthcare (遠大賽威信)	I	2024/12	40 years of age and older
Recombinant	GeneVax (吉諾衛)	I	2024/9	40 years of age and older
Recombinant	***the Company***	I	2024/8	40 years of age and older
Live Attenuated	Changsheng Biotechnology (長生生物)	III	2017/10	40 years of age and older
Live Attenuated	Shanghai Institute of Biological Products (上海生物製品研究所)	II (completed)	2018/12	40 years of age and older

Sources: CDE, Frost & Sullivan

Competitive Landscape of Zoster Vaccines Outside China

As of the Latest Practicable Date, there were two zoster vaccines approved by the FDA, namely Zostavax, a live attenuated vaccine, and Shingrix, a recombinant vaccine. The following table sets forth details of the zoster vaccines approved by the FDA as of the Latest Practicable Date.

Brand Name (Generic Name)	Technical Route	Manufacturer	FDA approval date*	Age Coverage
Zostavax	Live Attenuated	Merck	2006/05	50 years of age and older
SHINGRIX	Recombinant	GSK	2017/10	50 years and above/18 years and above who are or will be at increased risk

Note: The approval date is the time when the vaccine was first approved, without considering age-group expansion.

Sources: FDA, Frost & Sullivan

As of the Latest Practicable Date, there were 12 zoster vaccine candidates under clinical development outside China, primarily including 7 recombinant vaccines and 4 mRNA vaccines. The following table sets forth details of zoster vaccine candidates outside China as of the Latest Practicable Date.

Generic Name	Technical Route	Manufacturer	Clinical Stage	First Posted Date	Age Coverage	Location
Z-1018	Recombinant	Dynavax	I/II	2024/8	50-69 years of age	Australia
BV211	Recombinant	BravoVax	I	2023/2	30-70 years of age	NA
REC610	Recombinant	Recbio	I (completed)	2023/3	40 years of age and older	Philippines
ChAdOx1-VZV	Recombinant	CanSino	I	2023/8	50-65 years of age	Canada
CVI-VZV-001	Recombinant	CHA Vaccine Institute	I	2023/11	50-65 years of age	Korea
LYB004	Recombinant	Patronus Biotech	I	2024/3	50-70 years of age	Australia
EuHZV	Recombinant	Eubiologics	I	2024/5	50-69 years of age	Korea
CRV-101	Subunit	Curevo	II	2022/3	50 years of age and older	US
mRNA-1468	mRNA	Moderna	I/II	2023/1	50 years of age and older	Puerto Rico, US
IN001	mRNA	Shenxin Biotechnology	I	2024/1	50-69 years of age	US, Australia
VZV modRNA	Modified RNA	Pfizer	II	2023/1	50-69 years of age	US
JCXH-105	Self-replicating RNA	Immorna Biotherapeutics	II	2024/9	50 years of age and older	US

Sources: ClinicalTrials.gov, Frost & Sullivan

Market Drivers and Future Trends

The primary drivers and future trends of zoster vaccine market include:

- *Aging society.* The lifetime risk of herpes zoster in the general population ranges from 20-30% and significantly increases after age 50, reaching a 50% lifetime risk by age 85. As the global population ages, the number of individuals over 50, who are susceptible to herpes zoster, rises. This demographic is notably at risk for postherpetic neuralgia, a common and severe complication of herpes zoster, which can persist for extended periods, severely impacting the quality of life. The risk of having postherpetic neuralgia after herpes zoster also increase with age. Accordingly, there is strong market potential for effective zoster vaccines.

- *High reactivation rate.* Herpes zoster can reactivate later in life following initial varicella or chickenpox infection, particularly in the elderly or immunocompromised individuals. With over 1.5 million people afflicted by herpes zoster and its persistence of neuropathic pain each year in China, coupled with significant annual healthcare costs exceeding RMB1.0 billion, a substantial market exists for zoster vaccines.

- *Technical upgrades.* Zostavax, the first zoster vaccine, was a live attenuated vaccine approved by the FDA in 2006. Although Zostavax's efficacy declines significantly within six to eight years after vaccination, the market has evolved with the introduction of Shingrix in 2017. Shingrix, a recombinant protein vaccine, offers significantly better protection as proven in clinical trials. This technical advancement resulted in Shingrix's revenues reaching US$4.3 billion in 2023, when FDA discontinued lot release of Zostavax in the same year, underscoring an expanded market share for new vaccines.

- *Safe and effective innovations.* Advances in biotechnology and production process are leading to development of zoster vaccines with improved durability and stronger immunogenic responses. These developments are suitable not only for healthy individuals but also for the elderly and immunocompromised population. Innovations such as the mRNA zoster vaccine, which are currently being tested in rhesus monkeys, show promising extended immune responses with acceptable side effects.

- *High market penetration.* Improved production process and technology can also reduce manufacturing costs of zoster vaccines, lowering their prices and encouraging wider vaccination uptake. Enhanced safety and efficacy can also bolster the vaccine's applicability, expanding the user base and significantly increasing market penetration.

RESPIRATORY SYNCYTIAL VIRUS (RSV) VACCINES

Overview

The Respiratory Syncytial Virus (RSV) is a common virus affecting the respiratory tract, with symptoms often resembling a mild cold in upper respiratory tract infections. These symptoms are typically self-limiting. However, RSV can escalate to severe infections like bronchiolitis or pneumonia, particularly impacting vulnerable populations such as infants, the elderly and those with chronic illnesses. There were approximately 4.1 million new cases of acute lower respiratory tract infections caused by RSV in China in 2023. The virus, primarily transmitted via droplets and contact with contaminated surfaces, remains viable on such surfaces for about four to seven hours. An infected individual is typically contagious for three to eight days, although infants and individuals with compromised immune systems may continue to spread RSV for up to four weeks post-symptom resolution.

Despite the prevalence of RSV, the healthcare sector currently lacks a safe and effective vaccine or direct antiviral treatment. Current management of RSV infection relies on broad-spectrum antivirals and symptomatic treatment, although these are not fully effective in curbing the infection. Consequently, there is an urgent need for the development of an effective RSV vaccine.

The development of RSV vaccines has been a priority for the WHO since the 1960s. After the world's first two RSV vaccines obtained FDA approval in May 2023, the global RSV market, in terms of sales revenue, reached US$2.4 billion in 2023 and is estimated to reach US$11.9 billion in 2032, at a CAGR of 19.3%.

Competitive Landscape of RSV Vaccines

As of the Latest Practicable Date, no RSV vaccine had been approved by the NMPA. As of the same date, there were seven RSV vaccine candidates under clinical development in China.

As of the Latest Practicable Date, there were three RSV vaccines approved by the FDA, including two recombinant vaccines and one mRNA vaccine. As of the same date, there were 19 RSV vaccine candidates under clinical development outside China.

MONKEYPOX VACCINES

Overview

Monkeypox is a disease caused by infection with the monkeypox virus, an enveloped double-stranded DNA virus of the orthopoxvirus genus in the Poxviridae family. Symptoms typically include fever, rash, swollen lymph nodes and muscle aches, appearing between one to two weeks after infection. Certain individuals may harbor the infection without developing any symptoms. Monkeypox is transmitted zoonotically through rodents or direct contact with

infected animals or their secretions. Individuals diagnosed with monkeypox retain the potential to transmit the disease to others until such time as all lesions have fully healed and a fresh layer of skin has formed. Children, pregnant women and those with compromised immune systems, are at higher risk for severe symptoms and death as a result of monkeypox-related complications.

Since the second half of 2022, monkeypox has seen a notable increase in prevalence, drawing global attention. Initially concentrated in parts of Central and West Africa, the virus began to spread more widely, with outbreaks reported in several countries across Europe, North America and Asia. According to WHO, between January 1, 2022 and November 30, 2024 there had been a total of 117,663 confirmed cases of monkeypox worldwide, including 263 confirmed deaths. Monkeypox cases also emerged sporadically in China, with a total of 951 confirmed cases between September 2023 and November 2024. Although the incidence in China remained relatively low compared to heavily affected regions, China has been vigilant in its public health strategies to prevent widespread transmission.

While chemotherapies, including antiviral drugs such as cidofovir and ST246, are potential treatment options of orthopoxvirus infections, vaccines are also crucial for preventing infections. Traditional orthopoxvirus vaccines such as vaccinia virus vaccines have been associated with considerable adverse reactions. In response to these challenges, third-generation vaccines like modified vaccinia Ankara (MVA) vaccines and LC16m8 have been developed. These newer vaccines employ attenuation strategies to reduce side effects, thereby enhancing safety profiles while preserving immunogenicity. MVA-based vaccines have shown promising results in clinical trials by providing effective protection even post-exposure to orthopoxvirus.

Competitive Landscape of Monkeypox Vaccines

As of the Latest Practicable Date, no monkeypox vaccine had been approved by the NMPA and there was one monkeypox vaccine candidate under clinical development in China. As of the same date, there were one monkeypox vaccine approved by the FDA, which was a live attenuated vaccine, and three monkeypox vaccines (one live attenuated vaccine and two mRNA vaccines) under clinical development outside China.

VARICELLA VACCINES

Overview

Varicella, commonly known as chickenpox, is an acute systemic infectious disease caused by the varicella-zoster virus (VZV). While typically self-limiting in immunocompetent children, the disease can have more severe symptoms in adults and certain high-risk populations, including infants, pregnant women and immunocompromised individuals. Transmission typically occurs through airborne droplets or direct contact, leading to symptoms such as a characteristic rash, fever, malaise and headache, which appear approximately 10 to 21 days post-exposure. Although chickenpox is usually self-limited, complications such as secondary bacterial infections and, in severe cases, central nerve system involvement can occur. In China, varicella incidence shows a seasonal pattern, with peaks from May to June and from October to January of the following year. There were approximately 527,700 reported cases of varicella in China in 2023.

Treatment for mild cases involves symptomatic relief through antihistamines and soothing baths, whereas severe cases may necessitate antiviral therapy. Vaccination remains the most effective preventive measure against varicella, particularly given the disease's high infectivity rate. As such, vaccination plays a critical role in controlling outbreaks and epidemics, especially during peak seasons in winter and spring.

Competitive Landscape of Varicella Vaccines in China

As of the Latest Practicable Date, there were eight marketed varicella vaccines in China, all of which are live attenuated vaccines. As of the same date, there were two varicella vaccine candidates under clinical development in China, both of which are live attenuated vaccines.

TETANUS VACCINES

Overview

Tetanus is an acute specific infection caused by the entry of spores bacterium *clostridium tetani* into the body through wounds. It can be very dangerous and can cause death, and dirty wound may require tetanus booster immunization. The spores are found everywhere in the environment, particularly in soil, ash, feces of animals and humans, and on the surfaces of skin and rusty tools like nails, needles and barbed wire. The prevention of tetanus critically relies on both proper wound management and immunization. Primary prevention through active immunization involves the administration of vaccines containing tetanus toxoid to foster long-term immunity, while secondary prevention utilizes passive immunization techniques, introducing immediate immune effectors such as tetanus antitoxin (TAT) or immunoglobulin for acute cases. Tetanus vaccines can be categorized into single-component tetanus vaccines and combination vaccines. Single-component tetanus vaccines are generally adsorbed tetanus vaccines that focus specifically on tetanus prevention, while combination vaccines offer broader protection against multiple diseases simultaneously, including diphtheria, pertussis, haemophilus influenzae type B and hepatitis B, based on the vaccine type and target population.

Competitive Landscape of Tetanus Vaccines in China

As of the Latest Practicable Date, there were three marketed single-component tetanus vaccines in China, all of which were adsorbed vaccines. As of the same date, there were three single-component tetanus vaccine candidates under clinical development in China, all of which were adsorbed vaccines.

SOURCE OF INFORMATION

In connection with the [**REDACTED**], we have commissioned Frost & Sullivan to conduct an analysis of and prepare an industry report on the global and Chinese vaccine market. Frost & Sullivan is an independent global market research and consulting company which was founded in 1961 and is based in the United States. Services provided by Frost & Sullivan include market assessments, competitive benchmarking and strategic and market planning for a variety of industries. The sum of our contract with Frost & Sullivan for preparation of its report and conducting clinical audit is RMB550,000. The payment of such amount was not contingent upon our successful Listing or on the results of the report. Except for the report prepared by Frost & Sullivan, we did not commission any other industry report in connection with the [**REDACTED**]. Frost & Sullivan prepared its report based on its in-house database, independent third-party reports and publicly available data from reputable industry organizations. Where necessary, Frost & Sullivan contacts companies operating in the industry to gather and synthesize information in relation to the market, prices and other relevant information. Frost & Sullivan believes that the basic assumptions used in preparing its report, including those used to make future projections, are factual, correct and not misleading. Frost & Sullivan has independently analyzed the information, but the accuracy of the conclusions of its review largely relies on the accuracy of the information collected. Frost & Sullivan research may be affected by the accuracy of these assumptions and the choice of these primary and secondary sources.