

CHINA
PHARMACEUTICALS
2018



*Market Characteristics - Human Capital - Financial Investment
Regulatory Reform - R&D - Technology*

INNOVATION FOR GOOD HEALTH

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Dear Reader,

Welcome to the first edition of the China Pharmaceutical Industry Report, a joint CPhI-GBR analysis to be launched at CPhI China in partnership with the China Chamber of Commerce for Import & Export of Medicines & Health Products (CCCMHPIE), that examines the extraordinary changes occurring in China's pharmaceutical industry. After having received such a warm reception from the pharmaceutical community in China, we expect to return for the years to come in order to provide continuous market updates as China prepares to overtake the United States as the world's largest pharmaceutical market as soon as 2020.

Our research for the 2018 edition focused around the theme of innovation. China's pharmaceutical market has long been considered in terms of its strength in generics, but GBR discovered that a dynamic capital market, a revamped regulatory framework and the return of talent from overseas have all contributed to fostering an environment ripe to support novel drug discovery.

The pulse of innovation emanates from Shanghai and can be felt along the veins of the wider Yangtze River Delta region, where a burgeoning biopharma sector is emerging. Across the drug development value chain, stakeholders are taking advantage of growing demand for more complex services, and regional governments are competing to draw talent into their jurisdictions. Although it will be a few more years before projects hit the markets or the innovation ecosystem reaches a state of equilibrium, the time to turn towards China is now.

The following pages bring together thoughts and opinions from interviews conducted with some of the pharmaceutical industry's most insightful leaders across the value chain, from consultants and law firms that provided authoritative voices on the direction of the legal and financial frameworks, to startups on the cutting edge of new technologies and well-established pharma giants that are demonstrating extraordinary dexterity in evolving with the times.

We would like to warmly thank our partners at CCCMHPIE and ChinaBio Consulting for their continued support, as well as to all the executives and researchers who shared their valuable time and insights with us.

I hope that you find the following pages interesting, enjoyable and informative, and GBR looks forward to providing annual up-dates on the industry and strengthening our bonds with China's pharma industry.



Rutger Oudejans
Brand Director
CPhI



Alice Pascoletti
General Manager
Global Business Reports (GBR)

China: Transformation & Innovation

- 8. Introduction: An Overview of China's Transformation
- 9. Interview with China Chamber of Commerce for Import & Export of Medicines & Health Products (CCCMHPIE)
- 11. Interview with ChinaBio Group

People: Market, Patients & Practitioners

- 14. People: Market, Patients & Practitioners
- 15. Patients: A need for solutions for rising noncommunicable disease and an aging population
- 16. Brain Regain: The rise of the returnee
- 17. Institutional Reforms and Human Capital: Next steps for driving innovation
- 19. Interview with Heidrick & Struggles

Policy: A Renaissance in Regulation

- 22. Policy: A Renaissance in Regulation
- 22. Achieving quality through consolidation
- 24. Policies that push innovation
- 25. Interview with Cooley
- 26. Interview with Finnegan
- 27. Interview with Complya Asia

Capital: Springtime in China

- 30. Capital: Springtime in China
- 30. VC/PE Funds: Mutually Beneficial Relationships Wanted
- 31. Interview with Asieris
- 32. Mergers & Acquisitions: Driving Innovation through Integration
- 33. Going Public: Opportunities in Hong Kong
- 35. Interview with Deloitte
- 35. Interview with PwC
- 36. Interview with BVCF
- 37. Interview with OrbiMed

R&D: Is Innovation Really Happening?

- 40. R&D: Is Innovation Really Happening?
- 42. Biopharmaceuticals: The Future of Innovation
- 44. Hot Themes in China's R&D Pipelines: Cutting-Edge Approaches and Technologies
- 47. Interview with Fosun Pharma
- 48. Interview with Pfizer
- 49. Interview with JLABS Shanghai
- 50. Interview with 3SBio
- 51. Interview with Cell Signaling Technology
- 52. Interview with 3D Med
- 53. Interview with Phagelux
- 54. Interview with Genechem
- 55. Interview with EpimAb

Services: Constructing an Innovation Infrastructure

- 58. Services: Constructing an Innovation Infrastructure
- 60. Building Capacity for Biopharmaceuticals
- 63. Interview with Porton Pharma Solutions
- 64. Interview with CMAB
- 65. Interview with TOT Biopharm
- 66. Interview with BioDuro
- 67. Interview with Sundia

Conclusion: Embracing Disruptive Technologies

- 70. Conclusion: Embracing Disruptive Technologies
- 71. Interview with DATATRAK

Editorial Content

Global Business Reports provides on the ground analysis of the trends shaping the China pharmaceutical industry.

8, 14, 22, 30, 40, 58

Exclusive Interviews

Insights from leaders across the value chain that are helping to shape the industry.

9, 19, 25, 31, 36, 47...

Data & Infographics

Understand better the trends and characteristics of China's pharmaceutical industry.

15, 21, 32

Key R&D Trends

An overview of the hot research trends in China and key players that are driving the industry forward.

40-55



CHINA PHARMACEUTICALS 2018
 Industry Explorations
 CPhI & Global Business Reports

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China

- International Boundary
- State Boundary
- ★ National Capital
- State Capital







China: Transformation and Innovation

"China has seen significant advances in healthcare reform such as the world's largest medical insurance system, rural healthcare coverage, introduction of catastrophic disease insurance, regulatory and public hospital reforms and the recent update to the NRDL that will help increase patient access to quality medicines throughout China. We believe that two key priorities— access on one hand; and innovation and quality on the other— are both vital if China is to continue to make significant strides in the next 30 years in the area of health."

- Dr. Wu Xiaobing,
Country Manager and Pfizer China and Regional President,
Pfizer Essential Health Greater China



Introduction:

An Overview of China's Transformation

8

Dramatic transformation is not unexpected or unusual in China, due to its unique political structures and abundant economic resources. The now iconic Shanghai skyline is a prime illustration; in 1992, the land in the region known as Pudong was little more than farmland.

Concerted injections of capital and strategic economic planning on behalf of the government birthed a striking cityscape that now reigns as China's leading commercial and industrial city and one of the preeminent financial centers in the world. Industrial zones like Zhangjiang Hi-Tec Park that are geared towards supporting the development of high-tech industries have been centerpieces to this transformation. Located in Shanghai's Pudong New Area and covering a core area of 25 square km, Zhangjiang hosts well over 6,000 enterprises across various industries, and it is perhaps here that one can best witness China's efforts to elevate the pharmaceutical and biotech industries. The country has experienced rapid growth, going from the 9th largest pharmaceuticals market in the world in 2007 to second at present, and it is set to overcome the US as number one by 2020.

The pharmaceutical landscape in China has been traditionally marked by incomprehensible fragmentation in its distribution and manufacturing sectors. The market is dominated mostly by the generics and ingredients sectors, which focus on small margins and are often associated with questionable quality. Notwithstanding the extraordinary shifts occurring in the industry that will be the focus of this publication, this description reflects the industry's current state; over 75% percent of drugs are generics and an additional 11% are Traditional Chinese Medicines (TCMs). Compared to the US, which contributes roughly 50% of the world's global drug innovation, China only represented about 4% in 2017, according to the Financial Times. Between 2006 and 2015, China only introduced 19 new drugs to the market whereas the US contributed 196. The World Health Organization (WHO) reported that Chinese pharmaceutical companies typically only reinvest 5% to R&D activities, which is largely geared towards "me-too" or "me-better" initiatives. However, while the generics sector will undeniably continue to be the driving force in the industry's growth for the foreseeable future, greater emphasis on patented

drugs and innovation have become a development imperative. Underpinning this emphasis placed on upgrading its pharmaceutical sector is not just a desire to elevate industry, but a response to meeting the needs of a large and evolving population. In October 2016, the China government promulgated Healthy China 2030, a blueprint that outlines its ongoing intents to prioritize health as a precondition for sustained social and economic development. What makes the document so unique is not just the extraordinary expression of political intention to prioritize progress in China's healthcare sectors, but the recognition that supporting innovation will be central to the government's objective to achieve its agenda. While certainly not the starting point, the initiative underscores the central government's instigation of a regulatory overhaul, active recruitment of talent from the Chinese diaspora abroad, and increased spending all geared towards supporting the life sciences.

The innovation push can be discerned geographically as emanating from the wider Yangtze River Delta region, where industrial parks in Shanghai, Suzhou, Nanjing, Hangzhou, and other key cities are all com-

Zhou Hui

President

CHINA CHAMBER OF COMMERCE FOR IMPORT & EXPORT OF MEDICINES & HEALTH PRODUCTS (CCCMHPIE)



Can you provide a brief history of CCCMHPIE and highlight how it serves a bridge between the pharma industry in China and the government?

Founded in 1989, China Chamber of Commerce for Import and Export of Medicines and Health Products (CCCMHPIE) was registered at the Ministry of Civil Affairs, and is now China's largest healthcare industry association composed of research, production and trade companies in the healthcare sector. CCCMHPIE develops together with China's healthcare trade and investment, and now it covers such areas as TCM raw materials, herbal extracts, TCM patent drugs, APIs, pharmaceutical finished products, biochemical products, hospital diagnostic devices, health and rehabilitation equipment, medical dressings, health products, functional cosmetics, etc. With over 2,500 member companies, it covers the most representative and influential pharmaceutical, medical device and health product companies in both China and abroad.

As a bridge connecting the government and enterprises, domestic and overseas markets, CCCMHPIE leverages its resources and connections in the industry to facilitate social governance for the government, improve public service and nurture a good policy environment. It gives full play to the role of industry associations, and increases the status of China in the global healthcare industry through improving the industry standards, regulations, technologies, branding and trustworthiness. It takes active steps to offer trainings and conducts research project with the aim to guide its members in their innovation-driven strategies. It also assists member companies in increasing international competitiveness by giving priority to research, brand building and promotion.

The CFDA has introduced sweeping changes to the regulatory environment in recent years. How have domestic companies been impacted as they adapt to meet more stringent standards?

In recent years, against the backdrop of medical insurance fees control and supply-side reform of the medical sector, there have been some changes in China's drug regulatory policies. A number of drug regulations and policies have been adopted, including reform on the review of drugs and medical devices, abolishment of API approval, launch of MAH, equivalency assessment on quality and efficacy of generic drugs, change of GMP and GSP certification into daily surveillance, and the two invoices policy in the supply chain. These policies are expected to increase affordability of drugs for the public, raise overall quality levels of the healthcare industry, promote industrial re-structuring and upgrading, and further enhance international competitiveness for the industry. For Chinese companies, regulation is getting more stringent than ever, and it seems inevitable to have some tough experiences in the short term, and those failing to meet new requirements will be forced out of market. However, in the longer term, companies who actively follow regulation changes and give priority to innovation and quality will embrace another round of development. Guided by supporting policies, innovation and internationalization will become the themes of development for pharmaceutical companies.

What progress has China made towards bolstering the availability of a highly skilled labor force in support of its pharmaceuticals industry?

Bearing in mind the need to promote TCM innovation and international drug registra-

tion, we have created the mechanisms to introduce, nurture and incentivize talented people, and create a sound environment for them to demonstrate their skills and capabilities. First, we have introduced the One Thousand Talent Project to attract overseas high-skilled Chinese talents specialized in conducting innovation and international registration to come back to China to start businesses. Second, centering on improving drug quality standards and corporate competitiveness, we have taken active steps to train our executives, thus nurturing an array of leading entrepreneurs for the industry. Third, we have intensified occupational and skills training, and aim to build a group of high-skilled professionals through establishing our own educational and real-practice bases. Fourth, we have set up a business innovation center to train professionals and form a synergy through promoting innovation and resource sharing.

What role will Chinese companies play in a securing a more healthy future for mankind?

Humankind is facing a series of new challenges as a result of industrialization, urbanization, aging, disease spectrum changes, ecological degradation and change in lifestyles. The Chinese healthcare industry will focus on three aspects: first, promote technology innovation, particularly innovation capacity on patented drugs, innovation TCM drugs, and new types of formulations. Second, improve quality standards systems, and promote alignment of drug standards with international levels. Third, deepen international cooperation, and further promote internationalization of the industry through resource allocation on a global scale. ■

Image courtesy of BioDuro

peting to pull talent and resources to their respective cities. Although private parks exist, most industrial zones are run by provincial and local governments, which can provide incentives including seed funding as well as reduced rent or free space allocation.

While the changes and growth have been unprecedented, there is still a shroud of mystery and often misconception surrounding China's evolving pharmaceutical industry. Greg Scott, CEO of the consulting company ChinaBio, said: "As word spread about our expertise and the knowledge that we have about China, we began to receive requests for more information," he said. "Particularly during the period when we first arrived, it was very challenging to find information on the industry — a problem that persists even today."

GBR aims to help fill this void through a comprehensive and consolidated resource that introduces the industry and some of its key players to our international readers who are curious to learn more about the opportunities in this dynamic environment. We sought the guidance and insights of industry consultants like ChinaBio, and spoke to companies across the value chain to understand their experiences interacting with one another and how they are navigating the unique business environment. Our report begins first by introducing the China population, demographic trends before exploring how recent regulatory reforms support innovation, highlighting where gaps still remain. We present the investment environment and market trends through the voices of financiers, consultants, and those seeking funds. We then highlight some of the most exciting developments in the R&D space, from multinational and China Big Pharma, to a rapidly growing biotech space. Next, we seek to understand what support is available in the services sector and how companies are expanding their capabilities to meet burgeoning demand. Finally, we look towards the future, focusing on how the capabilities of digital technologies, Big Data, and AI hold promise not just for China's pharma industry, but worldwide. ■





Greg Scott

CEO
CHINABIO GROUP

ChinaBio morphed from being an angel investor in China to becoming a consultant for foreign companies looking to enter the Chinese life science space.

ChinaBio Consulting has been operating in China for 11 years now, yet when you arrived in the country as an angel investor, you did not intend to build a company. How has your mandate changed and what is the key focus for ChinaBio today?

As word spread about our expertise and the knowledge that we have about China, we began to receive requests for more information. Particularly during the period when we first arrived, it was very challenging to find information on the industry — a problem that persists even today. ChinaBio has been tracking things like VC investment since 2007, and consequently we started responding to requests for consulting engagements from people interested in gaining more data about the industry. While we are still involved in the angel investment activity, the main focus of the company now is consulting and advisory services. We work with a large range of companies, from pharmaceutical and biotech to medical device and diagnostic companies, as well as large multinationals all the way down to one-person operations.

China has long been known as a generics market, but recently there has been a buzz of innovation capturing the attention of the global marketplace. What are the key elements generating that stir?

The returnees are a major driver for innovation in China because they have been Western educated and boast many years of experience in the West that they bring back China. Government statistics show that in the past four years, there have been over 400,000 returnees coming back to China annually. The last six years have seen 2 million in total return, and we estimate that roughly 15% of those are in the life science space. We have seen the leadership of companies completely change from primarily being Chinese-born management to almost exclusively returnee management, which has profoundly shifted how business is being done in China.

The other drivers are finance-based. The Chinese government is injecting huge amounts of capital and, from the time we arrived in 2007, investment into the life sciences has increased 10 fold from about US\$10 billion to US\$100 billion per year. Grants from the central government such

as the Thousand Talents program, a cross industry initiative, play an important role. Hundreds of companies in the life science industry have received this funding, which can be upwards of US\$1 million to be used in support of a wide scope of activities, and a lot of good things have come from this sort of opportunity. Private funding, venture capitalists and PE funds have also played a significant role in driving innovation. Last year, for example, VC and PE funds raised over US\$40 billion to invest in China life sciences, a number that has doubled for three years consecutively now, putting China on par with the U.S. for VC funds last year.

What government efforts assist the industry in competing with other global pharmaceutical jurisdictions?

The government is trying to elevate their policies and procedures to be comparable with the U.S. and Europe. For example, tacit IND approval now occurs in 60 days where before it was explicit approval that took as long as two years. CROs can now run clinical trials here in China to international standards.

What do you perceive as the most critical issues that need to be addressed in order for China to recognize its full potential as a leader in the global pharmaceuticals market, and what role will ChinaBio play in this future?

The primary issue is not China's capability; over time that's going to develop without question. The key issue is that a lot of the Western companies still do not quite understand the country. We still occasionally hear concerns about IP protection in China. However, all the big pharma players are developing IP in China and it is not an issue. To companies that have not been here it can be a bit scary. My first recommendation to people is to come to China to understand how far the country has come and to become more comfortable with the environment. The other thing we tell companies is not to come here unless you have guidance or enough resources. It is better to come with a partner that can help you with the hurdles you may encounter because things are done differently here, and there are still many communication and cultural issues. ■





People: Market, Patients & Practitioners

"Generally speaking, you can find new science anywhere, but what is special in China is the enormous resource of talented scientists, concentrated patient pools, and an increasing number of highly capable pharma leaders."

- Mark Engel,
CEO,
Phagelux



People:

Market, Patients, & Practitioners

14

The sheer size of China's population — the world's largest at 1.415 billion — has obvious appeal as a commercial market. The country's rapid movement towards urbanization and the emergence of a robust middle class only continue to strengthen the China consumer's purchasing power, and any company in a commercial industry that has a global outlook needs to be paying attention — not least the pharmaceutical industry. Brookings estimates that by 2030, 2/3 of the world's middle class will come from greater Asia, and upwards of 780 million are projected to reside within China. By that time, the global middle class is expected to spend around \$64 trillion, representing around 1/3 of the global economy. China's per capita income has been steadily increasing, and was last recorded by the World Bank in 2016 at \$8,123.18 with an annual growth rate of 6.1%. When adjusted for purchasing power parity (PPP), that number is \$15,529.1 and about 80% of the world's average. With housing and health-

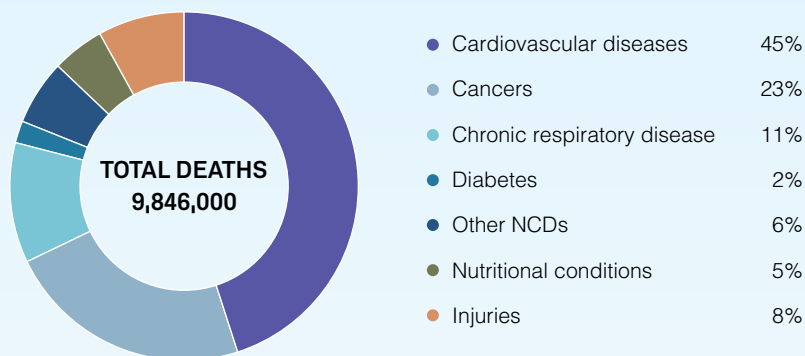
care expected to be the two fastest growing categories for consumer spending in China, the pharmaceutical industry can scarcely ignore the market opportunity. Consumption of pharmaceuticals expressed as a percentage of GDP is far below OECD averages at just 5.4%, but McKinsey projects that over the next decade, private health expenditures by urban consumers in China will see an annual growth greater than 11%. Similarly, Deloitte predicts that China's out-of-pocket and private insurance healthcare payments are expected to continue rising, an assertion punctuated by a reported CAGR of 15.5% for pharmaceutical sales between 2010 and 2015.

Psychographic observations of China's evolving market reveal trends that support projections of increased healthcare expenditure. Economic growth and subsequent increases in affluence produce a shift in attitudes towards health, and consumers in China are far more concerned about the safety and quality of the drugs they con-

sume than in previous times. Yet China's healthcare facilities are currently incapable of supporting burgeoning market demand from consumers that are also increasingly more aware of more affordable and better quality drugs that are available outside their borders.

China's patient population is able and willing to spend, but the issue will be whether the pharmaceutical industry has the capacity to fill the void. While demand for top level talent still far exceeds supply, China does have the advantage of a large workforce with relatively lower salary requirements. "The US has more advanced, highly trained manpower, particularly in early drug exploration focusing on biology and medical research," said Dr. Jim Li, CEO of Sundia, a leading CRO. "However, when talking about chemistry synthesis, the labor force in China provides an advantage because at this technical level there is not much difference in terms of skill but China offers a cost benefit."

Proportional mortality (% of total deaths, all ages, both sexes)

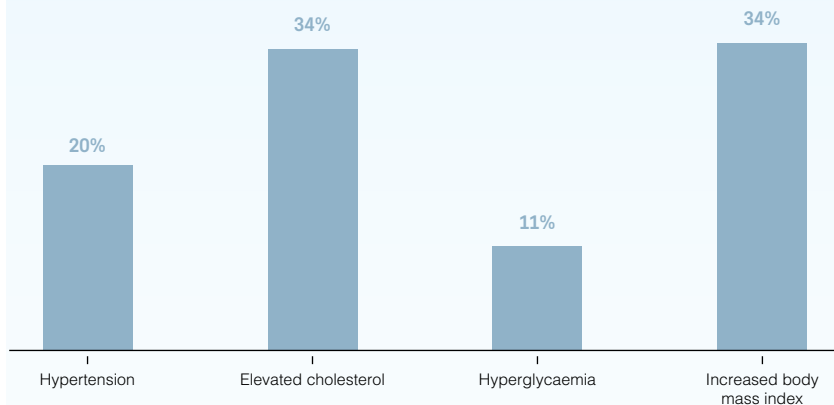


Patients: A need for solutions for rising noncommunicable disease and an aging population

Beyond a growing orientation towards increased healthcare spending, several unique features of China's population and its particular medical needs will also demand strong performance from its pharmaceutical industry. As China increasingly benefits from more modernized technologies and medical treatments, there has been a discernible shift from communicable disorders to chronic noncommunicable diseases (NCDs). In terms of development standards, this is a positive sign and testament to the evolution of China's society towards meeting the government-set benchmark of becoming a "moderately prosperous society." However, the subsequent shift in the lifestyles of China's people has created a worrying rise in NCDs, which represent the top health threat in China, accounting for about 87% of total deaths in the country in 2011 according to WHO.

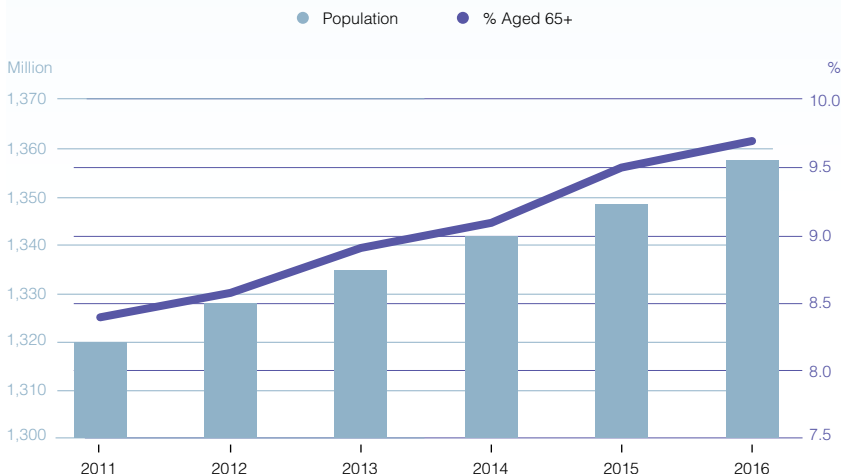
Prevalence of risk factors for NCDs in China (2010)

Source: World Bank, 2011



Aging Chinese population

Source: EIU, Espicon



Several health risk factors accompany increased urbanization as populations become more exposed not only to higher levels of pollution, but also the unhealthy behavioral changes that are correlated with urban life. Between 1980 and 2009, China's urban population grew more than three times to include 622 million people, and by 2020 a further 200 million migrants are expected to spill into the nation's cities. According to a report co-authored by the London School of Economics and the Development Research Center of the State Council of China, many features of urban ways of living such as smoking, alcohol consumption, sedentary lifestyle, and poor diet are all risk factors that lead to increased occurrences of impairments like hypertension, high cholesterol, and obesity. In turn, NCDs like diabetes, cardiovascular diseases and cancer are all on the rise.

Furthermore, China's population is aging rapidly, and with increased spending on social security measures putting greater levels



The market needs people that have the expertise to help make this country a better place for everyone, especially in the pharmaceuticals industry. As returnees, we grew up here and have a love for this country. China provided a great opportunity for us to come back and contribute to the overall innovation by bringing in fresh perspectives and talents.

- Ningling Wang,
Managing Partner,
Finnegan



of expendable income in their wallets, the country's elderly represent a key market segment that will contribute to growth in healthcare spending.

The demographic consequences of China's controversial one-child policy contributed to and further underline the need for greater emphasis on research that alleviates NCDs associated with aging. The policy was first launched in 1980 as a government strategy to reduce fertility rates and increase China's per capita GDP growth. The initiative was phased out between 2015 and 2016 with the China government's acknowledgment that it must respond to its rapidly aging population, and families are now permitted to have two children. However, fertility rates had already begun to decline prior to implementation of the one-child policy and show little sign of sustained recovery. Conversely, life expectancy has increased and after over 30 years of this restrictive population control measure, the repercussions are now inevitable. "Based on data presented by UN Populations Division MIT AgeLab 2010, it is expected that the population of individuals over 60 years of age will reach 437 million," said Jay Dong, GM and Global VP of CST China. "It is perhaps unprecedented in world history that a single government policy could alter the distribution of the human population so drastically. As a result, society will face a disproportionate burden in coping with the challenges that accompany a large population of elderly people," he added.

WHO reports that in 2013 almost one in two of elderly people in China, or 100 million, experienced noncommunicable diseases, and the country will gain an additional 40% increase in chronic noncommunicable disease by 2030. Because of the absolute increase in the elderly population, an accompanying increase in the absolute number of patients suffering from diseases like stroke, Alzheimers, and cancer, for example, will also increase. WHO distinguishes between average life expectancy and healthy life expectancy (HALE), which is defined as the number of years in which an individual can expect to live a healthy life. The gap between those two figures is increasing in China; WHO reports that between 2010 and 2050, the prevalence of care-dependent elderly will increase from 5.6% to 7.6% of the total population. The rise in NCDs, spurred by the country's unnatural age distribution, represent challenges that are opportunities for an innovation-focused pharmaceutical sector.

Brain Regain: The Rise of the Returnee

A conversation about the extraordinary transformation in China's pharmaceutical industry cannot be had without mention of the returnees. Returnee is a term that encompasses individuals of Chinese heritage that have returned to China, typically to take advantage of the numerous opportunities to contribute to the country's fast-

growing economy. ChinaBio reports that in the past six years, of the 6 million returnees have come back to China, 250,000 are in the life sciences space. These individuals are generally Western-educated and have gained solid professional experience working and researching abroad.

Little that happens in China is by accident, and this wave of returning talent is no different. The China government has introduced many incentives designed to incentivize and galvanize Chinese scientists and thought leaders to come back, including perks ranging from competitive financial compensation to accommodation and education subsidies and meal allowances. The Thousand Talents Plan is one such initiative that was launched in 2008 and provides applicants with a 1 million yuan (US\$151,000) starting bonus, as well as potential access to research funds from 3-5 million yuan. Jonathan Zhu, Partner Practice Leader for China Life Science & Government Affairs at executive recruitment firm Heidrick & Struggles highlighted the talent gap that presents well-compensated opportunities for returnees: "The talent landscape in U.S. and China are vastly different. China's demand is much greater than the supply of talents, whereas the opposite scenario is true in the US. This makes top level management positions in China a huge area of demand and the top layer of the industry enjoys very high compensation. The income gap between the top and the bottom is significant because everyone

wants the same people, which is further driving demand,” he said.

Beyond bringing scientific knowledge and know-how to propel China’s innovation push forward, returnees are also able to leverage their experience working in sophisticated markets to improve China’s business environment. “This group of people is the right age, has often been educated overseas, and have the right experiences to understand organizationally how to build a company,” affirmed Mark Engel, CEO of Phagelux, company focused on developing a pipeline of antibacterial products. As will be discussed in the next section, China’s life sciences sector can benefit immensely from a fresh perspective on how to compete in international markets, and returnees are bring that knowledge into the country as well.

Far from being a phenomenon of isolated individuals, returnees form a community that in turn creates a supportive network of resources ranging from scientific talent to professional services and investment opportunities. BayHelix, an organization of leaders in China’s life sciences space, is a platform that encapsulates the power and potential of the returnee. With membership spanning around the globe, the institution truly epitomizes the globalization of the pharma industry and brings the benefits of international knowledge and technology transfer to China’s market. “BayHelix is a club for executives in the life sciences area, and these individuals are brought together

by a belief that pharmaceuticals belongs to the world, and the Chinese people should also enjoy the benefits that advancements in medicine have afforded patients in every part of the globe,” said Ningling Wang, a returnee and the Managing Partner at IP-specialist firm Finnegan.



Scientists here are incredibly talented, and they are becoming more well-educated not just in science, but in the business of science.

- Mark Engel,
CEO,
Phagelux



Institutional Reforms and Human Capital: Next Steps for Driving Innovation

If institutions are the products of people, then the organizational structures of China’s domestic pharmaceutical companies can reveal much the progress of industry practitioners — and where gaps still remain. The government has implemented policies geared towards fostering healthy competition in the industry — policies that will force the domestic sector to elevate its standards and innovate, or die. “3SBio sees an opportunity in innovative drugs, which are expected to receive more government support and drugs with proven efficacy and superior clinical benefits at competitive costs are more likely to be covered by reimbursement,” affirmed Lou Jing, CEO of leading Chinese pharmaceutical company 3SBio. However, surviving in this demanding new environment will require a focus not only on accelerating innovation focused projects, but also on institutional reform as a strategic imperative.

Given that just 30 short years ago the Chinese private sector did not exist, the industrial-organizational structures of China’s domestic companies have not fully adapted to compete in an international context. A legacy of public sector bureaucracy taints many local Chinese companies, and there is arguably a cultural mismatch in China’s business etiquette and the approaches taken by the rest of the world’s more in-



We have recognized the need for scientists to embrace a spirit of entrepreneurship. There is huge gap within China in transforming innovation into a marketable drug that can benefit mankind. The Academy will train not only scientists, but also future business leaders that can help to better establish this linkage.

- Jay Dong,
GM and Global VP,
CST China



ternationalized pharmaceutical industries. Highlighting the particular problems this presents around corruption, James Lu, Partner at Cooley LLP China, confirmed that “A lot of hospitals and other providers are state owned, which causes issues within the pharmaceutical industry as hospital officials and managers are considered government officials. As is the case with many developing countries, the bureaucracy and layers of middle men can be prohibitive to efficient and transparent business transactions.”

Jonathan Zhu, Partner Practice Leader for China Life Science & Government Affairs at executive recruitment firm Heidrick & Struggles, highlighted another example of how this challenge manifests: “With the emergence of the private sector, all the resulting wealth in the market can be defined as “new” wealth. The spending pattern from this sector versus “old” money are very different,” he said. “New wealth takes a more short-term mindset and prefers to invest in things that can be touched and felt. Professional services such as accounting, consulting, or executive search are intangible in nature and so intrinsically the traditional mindset is not willing to spend money on these services.”

A 2017 survey of 558 executives conducted by Heidrick & Struggles in the APAC region provided fascinating insight into how companies view themselves in the dynamic global environment. In China, 85% of respondents agreed or strongly agreed with the statement “I expect the pace of disruption in my industry to increase over the next 18 months” but only 45% agreed that their company was well prepared to face market-

place disruptions. Only 43% of respondents in China believed their institutional structures were easy to navigate, and when asked which factors best-prepared a company for marketplace disruption, the calibre of the company’s people came first, understanding customer needs came second, and third was the ability to adapt strategic direction with agility.

Willingness to change in top-level management will drive this important shift, and already there is evidence that mentalities are changing, which presents an opportunity for professional services companies from executive search like H&S to advisory firms like Accenture to tap into a massive domestic client base offers. “Operational efficiency and strategy consulting services are fast-growing areas in China,” confirmed explains Yvonne Wu, Life Sciences Managing Partner at Deloitte in China. “Domestic players are faced with an increasingly competitive domestic environment, while at the same time looking to capture the potential of overseas expansions,” she said.

While small and medium sized domestic companies may struggle to adapt, China’s big pharma companies are leading the charge to great success in implementing these changes to their organizations, putting an emphasis on creating workplace environments that inspire employees. For example Fosun Pharma, one of China’s top five leading companies, offers a public library space and special extracurricular opportunities for its employees. Initiatives like these can attract more internationally-minded, younger

talent, but also work to promote a more internationalized corporate culture.

However, if it wishes to promote an innovation culture throughout society, the China government will have to follow through on its stated commitment to upgrading its education system to build the capacity in younger generations to participate in an innovation-driven economy. In the meantime, expect returnees and the private sector to play a critical role through training programs and special educational opportunities. Jay Dong, GM and Global VP of CST China, noted, “there are many young scientists in China, and we see an opportunity in providing training for these young people.” The company’s new Global Innovation and Training Academy will seek to provide educational opportunities with an emphasis on protocols and technologies that align with the industry’s rigorous technical demands. “Through the Training Academy, and through my mandate as Co-President of the Academia Industry Alliances Consortium of the Chinese Society of Cell Biology, we will connect science, technology, and also management,” Dong added.

At the 19th National Congress of the Chinese Communist Party (CCP) at the Great Hall of the People in Beijing, President Xi remarked that China must become a “country of innovators.” If the China government’s efforts to bolster the capacity of its homegrown talent are successful, the stage will be set and all the actors prepared to create a sustainable push towards innovation in the life sciences industry. ■



Jonathan Zhu

Partner Practice Leader for
China Life Science & Government Affairs
HEIDRICK & STRUGGLES

H&S is one of the top five recruiting firms globally and is expanding its services in China's rapidly growing life science sector.

How has H&S established its presence in the China life sciences industry?

If you look at the market, there are two segments — domestic Chinese POEs (Privately Owned Enterprises) and multinationals (MNCs). We cannot ignore either segment but the focus has mostly been with multinationals in the life sciences for three reasons. First, the MNC sector is very competitive, but relatively easy to execute compared to POEs, as utilizing professional services is a relatively new concept for the POE sector. Secondly, the receivables from multinationals are relatively reliable. Third and most importantly, the talent pool for both sectors is coming from multinational companies, so we are able to offer a strongly focused expertise that allows us to serve better across all sectors in the market.

H&S offers expertise not just in executive search, but also in the leadership advisory space. Can you elaborate on how H&S has evolved its service?

H&S is the first executive search firm established among the global top 5 firms. Looking at their revenue stream, consulting and assessment have gained an even greater share than the traditional search business within some of the firms. Being a public company allows easy access to our financial records to understand our operating models and revenue streams. Our new CEO Krishnan Rajagopalan's aim is to continue to strengthen our position in executive search while aggressively expanding into leadership consulting & assessment (Heidrick Consulting). H&S has made major efforts to expand into this sector by consolidating leadership consulting assessment services to increase market impact.

How would you describe the attitude towards services such as executive recruitment from domestic Chinese companies?

30 years ago, all the companies in China's market were public. With the emergence of the private sector, all the resulting wealth in the market can be defined as "new" wealth. The spending pattern from this sector versus "old" money are very different. New wealth takes a more short-term mindset and prefers to invest in things that can be touched and felt. Professional services such as accounting, consulting, or executive search are intangible in nature and so intrinsically the traditional mindset is not willing to spend money on these services. However, there has

been a positive sign of expenditure in this dimension for auditing services or corporate advisory for example, which represents new market potential for executive recruitment. Leadership consulting and assessments are even newer concepts in the market, and they are still undervalued. Therefore, executive search will remain the core business for firms like ours in China while anticipating the market maturity for other offered services.

How would you describe the current dynamic between supply and demand of talent in the China life sciences industry, and how do you expect this dynamic to evolve?

The talent landscape in U.S. and China are vastly different. China's demand is much greater than the supply of talents, whereas the opposite scenario is true in the US. This makes top level management positions in China a huge area of demand and the top layer of the industry enjoys very high compensation. The income gap between the top and the bottom is significant because everyone wants the same people, which is driving demand.

The future of the industry is dependent on the development of that management minus two layers. A lot of young people in China have the opportunity now to go overseas. My advice for this generation is to stay in the overseas market as long as possible before returning back. I truly believe only getting an education abroad does not provide the full scope of knowledge necessary to fit into the mainstream market. Three things best provide you with perspective through exposure: reading a lot of books, traveling a lot of roads, and meeting a lot of people.

How does H&S intend to support the China life sciences industry as it prepares to take the lead as the largest pharmaceutical market in the world?

Simply put, we are in a very unique position to help individuals, organizations, and industry. To gauge the quality of a leader, we look at three things. The first is decency, defined as a combination of integrity, compassion and humility. The second quality is the individual's capabilities, and the third is charisma. We weight these characteristics respectively at 50%, 40% and 10%. Through our efforts, we aim to make the industry reflect these qualities, which will encourage a solid foundation for a better world. ■





Policy: A Renaissance in Regulation

"China is evolving into a really strong market for pharmaceutical development and we are happy to be part of this transformation. In the past 7-8 years we have witnessed a lot of change from the regulation side. Against that framework, we believe we can realize our goal of developing a best-in-class compound globally. It is a good opportunity for us to make a positive impact for China and the world."

- Dr. Ye Edward Tian,
CEO,
Impact Therapeutics



Policy:

A Renaissance in Regulation

The China government must address the perennial dilemma that faces pharmaceutical policymakers worldwide: how to strike a balance between promoting growth in the industry while ensuring affordable and easily accessible drugs for its patient populations. In tackling this issue, the central government has emphasized a topdown approach; in addition to investing heavily, the government has rolled out a series of broad changes to the pharmaceutical regulatory environment. The policy agendas outlined in China's 13th Five-Year Plan and Healthy China 2030 each reinforce the importance that healthcare reforms such as decreasing inequality in the insurance coverage range and strengthening public services will have for the country's over strategic objectives, and there are many implications for the pharmaceutical industry, which is highlighted as a key pillar in reform measures. Pharmaceutical policy has historically been relatively disjointed and uncoordinated between provinces, but many recent initiatives are working towards restructuring the industry with the objective of improving its ability to compete internationally while still ensuring benefits are passed to the patient.

In terms of more industry-focused mechanisms, several key policy changes and regulatory reforms that have been recently introduced are geared towards consolidation as a strategy to enhance quality. Efforts to improve the efficiency of the distribution segment of the market, to apply stricter inspections across the value chain and more rigorous drug approval processes, and to place greater emphasis on EHS all intend to impact this space. Furthermore, the government has made great strides towards fostering a regulatory environment that encourages rather than inhibits innovation.

On paper, the change has indeed been sweeping. However, while the framework

is there, full implementation will take more time as the CFDA and other regulatory bodies move to bolster their capacity to conduct high-level inspections and enforce new policies across a vast industry in line with international expectations. "Europe's requirement that there be local certification of APIs before those products can be sold in Europe has put a burden on the Chinese regulatory system to improve their capacity to inspect and certify at a higher level," confirmed Dr. Scott Wheelwright, principal consultant at Comply Asia.

The China government has recruited from the FDA to assist in building its own human labor capabilities, and many companies that have already been independently operating to international standards to meet the expectations of global clients find themselves in training roles as China's inspectors adapt to new systems. The following sections dive into how companies are experiencing and adapting to these changes, while also highlighting the expected impact China's regulatory renaissance will have on both quality and innovation.

Achieving Quality through Consolidation

An underlying theme to China's regulatory overhaul is consolidation through internationalization. The country's rapid ascendancy to the International Council for Harmonization (ICH) in 2017 is a significant change that signals the country's intent to better promote its export market by aligning more closely to the stringent drug development procedures developed by its founding members: the US, European Union, and Japan. China's successful and speedy entry to the ICH is remarkable; joining is a rigorous procedure that typically takes years, but China achieved this in just seven months.

Joining the ICH has several implications for the local pharma landscape, partially in terms of Good Manufacturing Practices (GMPs) and reforms to the review of drugs. For example, API manufacturing currently requires that companies comply with both China's current regulatory framework and that of the nation where the APIs are destined for, however, the differences between both sets of rules will lessen as China becomes ICH compliant. While this enhances efficiency, it will also mean that the domestic landscape will be forced to elevate its standards, a process that was already in place prior to ICH through reform on the review of drugs. Greg Scott, CEO of ChinaBio, highlights one such example: "Two years ago, a policy was introduced that required any company wishing to submit drugs for approval to conduct a self-review, and if their data was not adequate, they had to either withdraw their application or the CFDA would penalize them by not allowing them to do another submission for three years. As a result, 60-80% of the trials were withdrawn. Manufacturing standards were raised at the same time, and we saw many companies close their doors. This created a much more high-quality environment in China overall."

For many companies — namely multinationals and China's big pharma players — whose operations have already been compliant with international industry best practices, these measures have had little impact except to reduce the competitive environment. Nonetheless, while ultimately red tape will be reduced, there are certain headaches that accompany new documentation requirements or inspection processes, which provides an opportunity to consultancy agencies with this expertise, or an additional competitive advantage to companies with the internal resources in place to adapt quickly to policy changes. "All our leaders have been trained



For Chinese companies, regulation is getting more stringent than ever, and it seems inevitable to have some tough experiences in the short term, and those failing to meet new requirements would be forced out of market. Undoubtedly regulation changes will present challenges. However, in the longer term, companies who actively follow regulation changes and give priority to innovation and quality will embrace another round of development.

- Zhou Hui,
President,

China Chamber of Commerce for Import &
Export of Medicines & Health Products
(CCCMHPIE)



in the US to deliver high quality services like back in the U.S. in China. Sharing experiences gained from audits and inspections across the two countries allows us to pool together knowledge of international standards and understand quickly any changes in perception of quality or practices in different regions,” said Zhang Tianyi, general manager of Frontage Laboratories.

China’s distribution segment is one area where regulatory reform has been particularly welcome. Containing over 13,000 players, most distributors service only local areas and some are focused on supplying only one or two hospitals according to a detailed report by ATKearney. The three top distributors in the market are Sinopharm, Shanghai Pharmaceuticals, and China Resources, who only account for roughly 20% of the sector. However, new initiatives such as improved Good Supply Practice (GSP) certification and a two-invoicing system will assist in simplifying the sector and enhancing transparency, largely to the advantage of these market leaders and other larger players with the capital resources to engage in M&A activities. Furthermore, the high costs of distribution should be alleviated with the intent of passing on that savings to the patients. “Traditionally, pharmaceutical products

were passed through second- and third-tier distributors before being purchased by public hospitals, which prevented price transparency and created a fertile environment for corruption,” explained James Lu, partner at Cooley LLP China. “However, a two-invoicing system is currently being implemented, whereby there the manufacturer issues an invoice to the distributor, and the distributor invoices the end customer. This is a positive development which has the potential to greatly reduce inefficiencies in the distribution chain.”

The improved drug supply security system, which is based on the national basic drug system, has also made great strides towards reducing the costs of drugs for patents. Since its implementation, the cost of basic drugs has decreased by around an average of 30% according to a report published by China’s State Council Information Office.

Additional efforts to consolidate the distribution sector will continue to assist the industry in its modernization.

In an effort to combat China’s pollution problem, many policies serve the dual purpose of reducing the pharmaceutical industry’s impact on the environment while also contributing to the consolidation process. Hefty fines can be imposed on companies found

not to be in line with new EHS standards, or can even lead to a factory shutdown, which has meant that companies sourcing from clients must have a strategy in place to ensure their operations are not disrupted. Roche, which sources pharmaceutical ingredients of Chinese origin for international markets, implements rigorous auditing practices on its manufacturing partners and has expanded its focus on EHS issues so as to minimize risk of any potential disruptions. “We have seen governmental involvement in addressing environmental concerns and factory shutdowns have had an impact the past two years and we are taking additional inventory positions ourselves, and working with our manufacturing partners to do the same at the plant level to ensure service to the end customers during these shutdown periods,” said Matt Thiel, President of the company.

The cost of waste disposal has also seen increases as there are only a limited number of companies certified by local authorities to offer services like solvent disposal or burnings. Some companies simply cannot survive the resulting market monopoly scenario, while others have seen additional financial burden. Further to that, the demonization of pharmaceutical manufacturing plants as hazards to local environments and communities has

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The stringent clinical inspection standards implemented by CFDA since July 22 of 2015 (called "722" movement) and ongoing quality & therapeutic equivalence evaluation of generic drugs have changed the entire atmosphere of drug research in China. Pushing the industry to meet high quality demands from the US and China in adherence with the CFDA and FDA inspections raises the bar for the entire CRO sector, and our cost and pricing structures and service capability provides us with an advantage in this scenario, which has led to fast growth of Frontage business in China in recent years.

- Zhang Tianyi,
General Manager,
Frontage
Laboratories



made it challenging for some companies to find welcomes hosts to their GMP factories. "Generic drug producing factories with lower margins that do not follow protocol and operate at lower standards have given rise to this untrue notion that all pharmaceutical manufacturing facilities pollute the environment," said Dr. Jim Li, CEO of leading CRO company Sundia, which boasts a client base of over 200 companies worldwide. "Companies like Sundia that are producing new drugs at higher margins have no issues complying to the standards set by the government."



Innovation in operational practices is one way that companies are adapting to any new strains introduced by the changes to China's EHS. "To address the pollution control and waste management concerns, we have been applying the green chemistry concept, which introduces new technology solutions such as microflow reactors and utilizing more benign solids when doing chemical reactions," said Alan Jiang, CEO of Cool Pharm, a supplier of pharmaceutical ingredients that just completed its our third site, a pilot scale lab, and has an increasing focus on international clients. "We have made an effort to recycle previous intermediates and solvents, which has reduced our waste production by about one third over the years. This ensures our production meets the government's high standards, and we also make our process more efficient by introducing SOPs on the production and management side," he added. In the past, protectionist policies have perhaps favored the local market too much, and heightening the competitive environment will inevitably lead to the death of players unable to adapt. However, China's strategy to squeeze its domestic manufacturing and distribution sectors will pay off as a more sustainable industry schematic emerges from the dust and higher standards allow the country to take better advantage of international markets. "Supply-side reform is showing results, as underdeveloped enterprises are gradually withdrawing from the market and superior companies are standing out, thanks to their high-quality products," confirmed Meng Dongping, deputy director of CCC-MHPIE, in a recent article.

Policies That Push Innovation

Further to enhancing patient access and drug affordability while elevating the operational practices, the government's regulatory reform has paid equal attention to fostering a pro-innovation environment, and many of the changes have been met with delight from the innovative pharma community. Some policies are uniquely centered on driving innovation, while others also continue to en-

courage consolidation within the industry by favoring companies that innovate.

For example, new procedures around establishing equivalency will further squeeze the generics sector by demanding proof of quality and efficacy, while also favoring companies that opt to pursue a course oriented around innovation. "In late 2015, China launched a new qualification process for generics that requires comparative clinical trials with an original drug to determine whether performance can be matched. These trials cost 12-15 million RMB per product at great risk of failure. Given the severe competition for generic drugs, this proved lethal for some companies as these drugs come with slim margins, leading to the mass exit of 900 companies by late 2016 and the trend is continuing," said Dr. Li from Sundia. "In combination with resources and incentives provided by central and local government, this has driven Chinese pharmaceuticals companies to search for new drugs, which provide higher margins and patent protection." ■



We are constantly developing new products, which means less competitors and higher profit margins. This helps us to reduce our costs and increase our revenue, which allows us to survive the regulatory shifts introduced by the government.

**- Alan Jiang,
CEO,
Cool Pharm**



James Lu

Partner
COOLEY LLP CHINA

Ranked among the top law firms worldwide, Cooley's highly specialized global teams advise clients on the full range of legal matters across Asia and the Pacific Rim.

Cooley LLP is a full service firm practicing exclusively in the technology and life sciences sectors that was formed in San Francisco in 1920. Can you briefly introduce the firm and its presence in China?

Today we are Silicon Valley's largest full service law firm and have a wide international presence of almost 1,000 attorneys, most of whom are working at technology centers in the US.

We moved to China in 2011 at the request of many of our existing clients. We were well-positioned for the expansion into China as we had been doing venture capital work here since 1989 when we helped form the first US dollar denominated VC firm in China. Our growth here has been rapid and sustained; we have been the fastest growing firm in the top US 50 law firms for the last three years. Inbound deals, with clients from the US and Europe, represent just over 50% of our business, and the rest are from Chinese clients, including a significant proportion of returnees.

Returnees are playing a huge role in driving innovation in the pharmaceuticals industry. How does Cooley support these individuals in their entrepreneurial endeavors?

Several new Chinese companies are formed by returnees who form an offshore parent company that they use to attract US dollar investment. We help them from beginning to end — from formation of the offshore company to designing their equity compensation model, their cap table, raising their first funds and applying their first patents.

What are Cooley's objectives for itself in China within the life sciences space?

Unfortunately Chinese law prohibits foreign firms from practicing in a lot of areas; for example, we cannot litigate in court and we can only have limited presence in front of a government official. Nonetheless, in terms of longer-term growth within China, we need to begin to offer full service in-country patent and litigation services. ■



Ningling Wang

Managing Partner
FINNEGAN

Finnegan in Shanghai helps Chinese companies protect and enforce their IP in the US and also helps foreign clients with patent litigation in China.

Finnegan first opened its offices in Shanghai in 2008. How has the pharmaceuticals industry evolved as a key client from then until now?

We are a small team here in Shanghai and our primary focus is to help Chinese companies protect and enforce their IP in the U.S., and we also help our foreign clients do patent litigation in China working with Chinese counsels. We work across several technical areas, including chemical, pharma, biotech, mechanical and electrical, and about 40% of our attorneys are specialized in the pharmaceutical area. Because the patent value in pharmaceuticals is so critical, this was an interesting field for us when we first arrived in China in 2008. However, initially we found very few companies that were demonstrating a drive towards innovation; most were focused on generics, particularly small molecule generics, which we do not represent. However, in the past 10 years we have encountered more and more innovative pharmaceutical companies, not just in small molecules, but also in the biotechnology area, which has brought on growth in our client base.

As a firm dedicated exclusively to the task of IP protection, what are the range of services you offer and how do these activities contribute to the innovation process in China?

We help clients draft patent applications, which is basic but a key and important task to help them protect their valuable assets. We also provide opinions on patentability, non-infringement, and freedom to operate, which are very helpful for our innovative pharmaceutical clients because they need this knowledge to attract investment and to minimize risks. When evaluating the assets, large pharma normally conduct due diligence and that is something we help our clients to defend. We want big pharma to see our clients not only have the technology but also strong patents.

What reforms in terms of patent protection have you seen as most impactful on behalf of the Chinese government?

Earlier in 2018, the central government announced that China will go ahead with patent linkage and data protection. We do not yet know the full details, but this

is undeniably a turning point for the pharmaceutical industry in China because that link between the approval process and the CFDA with the patent protection will give innovative pharma companies additional protection in addition to pure patent protection.

As a returnee to China working within the life sciences, what is driving your return and how are you assisting in developing a better life for wider Chinese society?

As returnees, we grew up here and have a love for this country. China provided a great opportunity for us to come back and contribute to the overall innovation by bringing in fresh perspectives and talents. The market needs people that have the expertise to help make this country a better place for everyone, especially in the pharmaceuticals industry. BayHelix is a club for executives in the life sciences area, and these individuals are brought together by a belief that pharmaceuticals belongs to the world, and the Chinese people should also enjoy the benefits that advancements in medicine have afforded patients in every part of the globe.

China is projected to be the largest pharmaceutical industry by 2020. What is Finnegan's expectation for the country and what gaps can be better addressed as it makes this transition?

Overall, we are optimistic about the future of the pharmaceutical industry in China as long as the leadership continues to be strong and to serve the people. If there is no political disruption, China will become a very strong market that will continue to attract innovative pharmaceutical players around the world. And the country needs this because of the needs of its patient population. As a patent attorney, we hope that the protection and enforcement system here in China also meets international standards so that whoever comes here will feel comfortable with their investment. Our experience in the U.S. regarding patent law and patent linkage will allow us to help clients to protect their valuable assets in IP in China, minimize the IP risks, effectively defend their IP rights, and appreciate the regulatory scheme and the interplay between the CFDA and the patent office. ■



Dr. Scott Wheelwright

Cofounder and Principal Consultant
COMPLYA ASIA

Complya Asia provides support for cGMP manufacturing and quality systems in Asia, focusing on helping our clients to achieve their goals of high quality manufacturing and meeting international standards for quality assurance.

Complya Asia helps with quality assurance in the manufacturing sector. Can you introduce the scope of your services in China?

Our goal is to raise the level of quality among manufacturers in China. We have two types of clients: companies coming primarily from the US and Europe that are sourcing from China. We help these clients to evaluate potential partners and identify any potential risks associated with manufacturing and compliance. We also work

with Chinese companies that want to do clinical trials abroad and need to be prepared for inspections from regulatory officials, in addition to doing some due diligence on behalf of investors.

How have you seen the regulatory overhaul in China impact the domestic manufacturing sector?

We have seen a gradual raising of the bar for manufacturing requirements in China. The current GMPs were promulgated in 2010, and part of the consequence has been to eliminate unqualified players, resulting in industry consolidation. Typically these companies go out of business because they do not offer anything attractive for a takeover scenario: they have small marketshare, low margin products, and facilities that cannot be economically upgraded. The recent ascension to the ICH has had a significant impact in making Chinese manufacturers feel that they are part of the US and European markets. In that vein, Europe's requirement that there be local certification of APIs before those products can be sold in Europe has put a burden on the Chinese regulatory system to improve their capacity to inspect and certify at a higher level.

Beyond introducing regulatory reform, how have you seen government and specifically local government work to support innovation?

Government groups compete with one another in China, largely through the provision of capital for equipment and facilities. Government organizations will fund the physical assets and provide space — they own all the property, so they can give significant discounts or provide free rent for fixed terms. One thing that has changed this year is the inclusion and specific mention of biotech drugs in government planning, which means that local governments are not as worried about investing in high-risk biotech because they now have the authority to engage in these riskier ventures.

How is the global trend towards outsourcing contract services playing out in China?

In the US and in Europe, we have seen virtual companies for over 20 years, meaning companies that have a handful of internal people and outsource everything else. This

has only been the case in China for the past year where there is now increased occurrence of outsourcing early stage development and manufacturing capabilities.

Can you elaborate on the implications that the newly introduced Market Authorization Holder (MAH) policy will have in terms of encouraging innovation?

In the past, biopharmaceutical companies were required to manufacture their product themselves, and they could not employ the services of a contractor. Although MAH has only been enacted in 10 provinces so far, the change is very encouraging. We expect it will broaden and become nationwide at some point. The single source rule presented limitations in that drug substance and product must be manufactured by the same company, which is not true in other parts of the world.

How will manufacturing companies in China need to evolve in anticipation of increased demand from the growing biopharma sector?

In China's small molecule sector, there are some organizations with very strong legacies in providing quality products to overseas markets. They have excellent manufacturing practices that have no problem passing international inspections. However, in biopharmaceuticals, we only have one company that has been inspected for a pre-approval inspection in China: WuXi Biologics. They were the first and only to receive their inspection. We expect more companies will join them as more companies move their programs forward, but the US will not inspect unless you file a license application.

Going forward, what changes will Complya Asia make to adapt its services within this dynamic environment?

We are in the process of assembling an industry best practices report, and we have identified 24 distinct areas where a company must be in compliance. For each of these areas we have identified a series of issues that in our experience the FDA focuses on. Now, we are going through these reports we have written on all these companies, and without providing names, we can give comprehensive advice about the best approach to take. ■





Capital: Springtime in China

"The investment in China biotech industry has been growing in a great deal in the past a few years. We keep cautiously optimistic of the trend although the biggest concern is whether the growth is sustainable. If funding comes too easily, the quality of drug candidates suffers. When some of these programs are unsuccessful, investors will be discouraged and they will pull back. If what we are experiencing now in the China capital markets is the spring, then winter will be coming soon when it turns to summer"

- Dr. Kevin Pan,
CEO,
Asieris



Asieris

Capital: Springtime in China

30

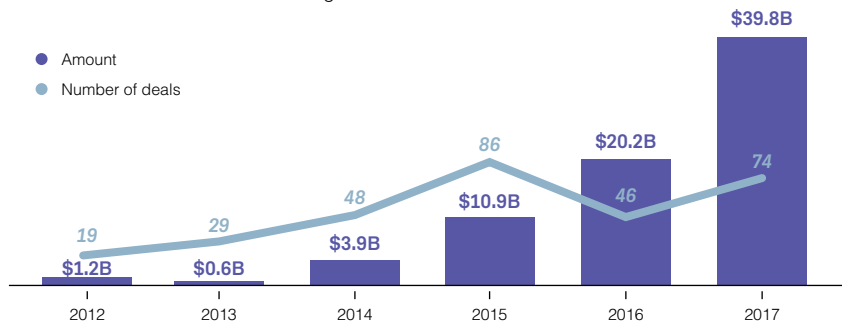
China's robust capital environment has undeniably contributed to the life science industry's stellar growth and supported its shift towards innovation. ChinaBio Consulting first started tracking the industry's financial progress in 2007, and has recorded incredible figures in both private and government spending. PE and VC funds have seen substantial increases, with over US\$45 billion raised and US\$12 billion invested in life sciences over a period of just 30 months. Significant injections of government funding have also demonstrated sustained growth, increasing by a factor of 10 over the past 10 years, from around US\$10 billion in 2007 to US\$100 billion in 2017. "In the Healthy China 2030 initiative, the government emphasized the importance of healthcare innovation and, if a company can demonstrate a true commitment to contributing innovative work, access to the capital market is not a problem," confirmed Wu Yifang, CEO of Fosun Pharma. Mergers and acquisition (M&A) activity has also flourished in recent years as companies both domestically and internationally look to boost their innovation capabilities through integration. Both the number of deals and average deal size have seen significant growth, and new opportunities in China's public markets also bode well, particularly for China's fast-growing biotech

VC/PE FUNDS IN CHINA

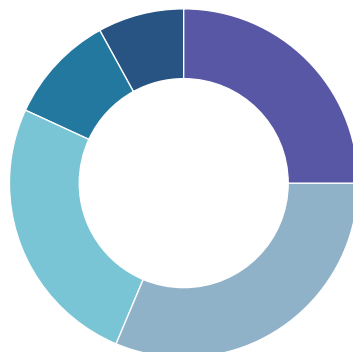
Source: ChinaBio

Total Funds Raised Targeting China Healthcare

Average fund size = record \$653M



Breakdown: VC Funds Raised by Sector



	AMOUNT
Service	\$3.8B
Diagnostic	\$3.3B
Drug	\$2.6B
Device	\$1.1B
iHealth	\$837

Dr. Kevin Pan



CEO
ASIERIS

sector. Notwithstanding a looming bubble and a need for more educated investors, all in all capital markets are well-positioned to support China's ongoing quest to innovate.

VC/PE Funds: Mutually Beneficial Relationships Wanted

The dramatic growth in the availability of VC/PE funds has been particularly instrumental in driving the growth of China's innovative biopharmaceutical sector. "10 years ago, China could not claim to have a biotech industry," explained Shoufeng Li, CEO of Aucta Pharmaceuticals, which has a presence in both Shanghai and Princeton. "Today, however, the quality of China's biotech industry is increasing dramatically. Deals are being made in the magnitude of hundreds of millions of dollars with some of the multinationals," he confirmed.

Despite the availability of capital in the market, however, competition for funds remains intense in China and the risk of early stage discovery is magnified as the industry continues to undergo rapid transformation and development. Subsequently, financiers are looking to invest in projects that can demonstrate a few specific qualities. Internationally oriented companies that are look-

32 >>

Has Asieris been able to tap into the government funding programs available for innovative researchers right now?

In 2015 and 2017, APL-1202 has won consecutively two terms of the New Drug Innovation Grant, a program of China's National Science and Technology Major Projects. I believe we are a perfect example to demonstrate how the government selects projects to support financially. APL-1202 is the first oral drug in clinical trials to treat non-muscle invasive bladder cancer worldwide and the first oral MetAP2 inhibitor moving into clinical trials for treating cancer. Being at the forefront of these areas caught the attention of the government's expert reviewers. They also liked our approach of repurposing an existing drug to fit a new indication because it reduces the risk considerably. We received a lot of recognition for our achievements because their criteria are based on how advanced your technology is in a global setting, how big the impact of the drug candidate is on the patients, and how likely your program is to succeed.

How does Asieris believe the financial environment in China will evolve as the first wave of innovation begins to see results?

The investment in China's biotech industry has been growing a great deal in the past a few years. We keep cautiously optimistic of the trend although the biggest concern is whether the growth is sustainable. If funding comes too easily, the quality of drug candidates suffers. When some of these programs are unsuccessful, investors will be discouraged and they will pull back. If what we are experiencing now in the Chinese capital markets is the spring, then winter will be coming soon when it turns to summer. We want to see a healthy inflow of funding that promotes a sustainable ecosystem. ■

31



BVCF

HEALTHIER AND WEALTHIER

In the past decade, BVCF invested in nearly 30 companies, and offered co-investment opportunities with a combined value of over US\$600 million. Its investments span across China and the U.S., covering a wide spectrum of highly promising subfields including healthcare services, innovative biologics, in-vitro diagnostics (molecular diagnostics), high value medical equipments and consumables, and medical big data and mobile medicine.

bvcf.com



In China, availability of capital is not an issue. There are plenty of VC and PE funds that are keen to find a good target. Unlike the US, however, we are still in the progress of developing a sophisticated investor base. Investment firms hire PhDs and have mature industry players within their teams, however, specifically listed companies suffer from the lack of a sophisticated public investor market.

- Felix Fei,
Partner & Co-Leader for
Life Science in Greater China,
EY



<< 31

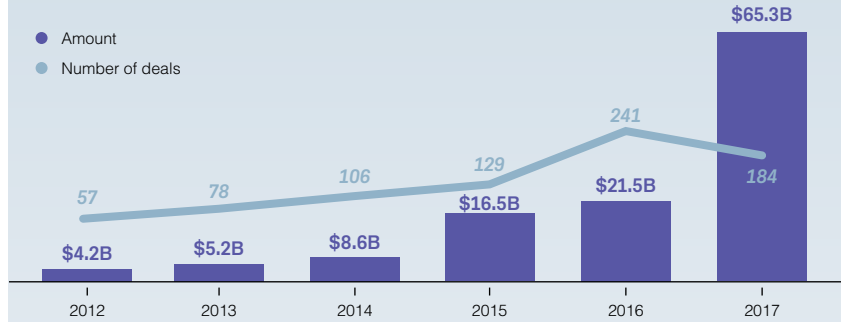
ing to introduce drugs with a global impact are preferred to those focused exclusively on the Chinese market. To that end, projects that address critical medical needs and utilize an innovative approach or technology are also key attributes sought by investors. However, there should be a demonstrable balance between innovative assets and assets that are further along the development pipeline in order to de-risk the company. Ultimately, however, the leadership of the company serves as perhaps the most critical component in an investment decision for Jonathan Wang, managing partner of OrbiMed Asia, one of the world's largest healthcare-focused funds: "The leader needs to be very sensitive to markets in addition to science and technology. Many times, individuals will not pay adequate attention to both of these areas, especially when it comes to scientists that know much about their field of research, but do not consider market needs and medical practice."

M&A AND PARTNERING ACTIVITIES IN CHINA

Source: ChinaBio

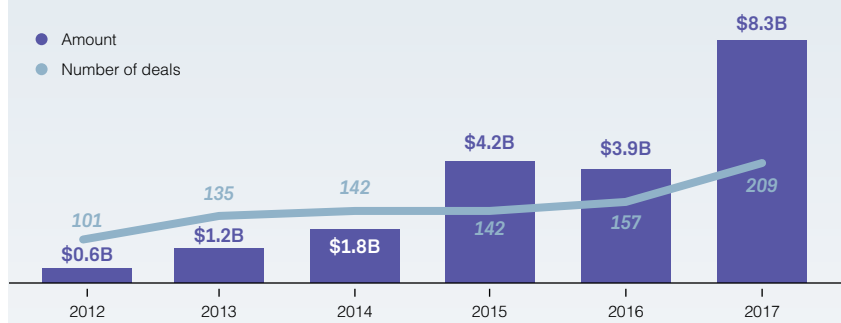
Total Value of M&A in 2017

Record \$430M average deal size



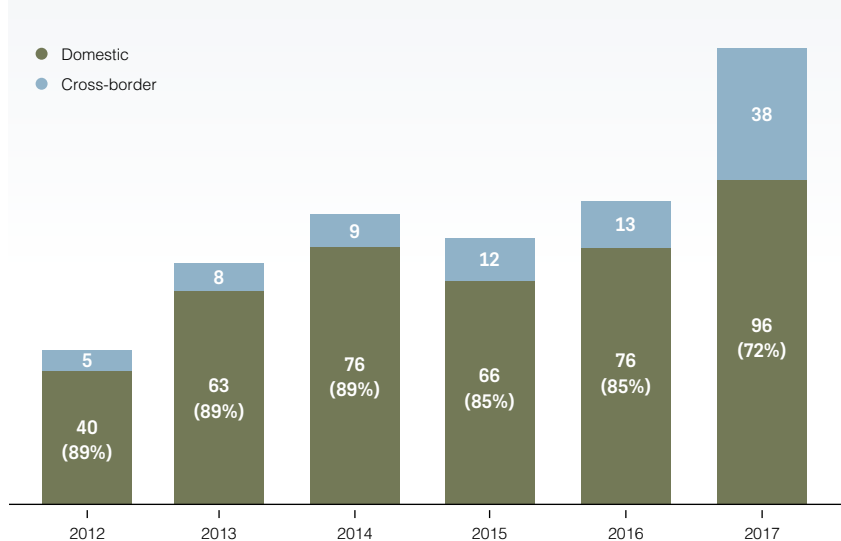
Total Value of Partnering Deals in China Healthcare

Average deal value hits record \$118M



Number of Partnering Deals: Domestic vs. Cross-border in 2017H1

Represents >70% of all pharma partnering

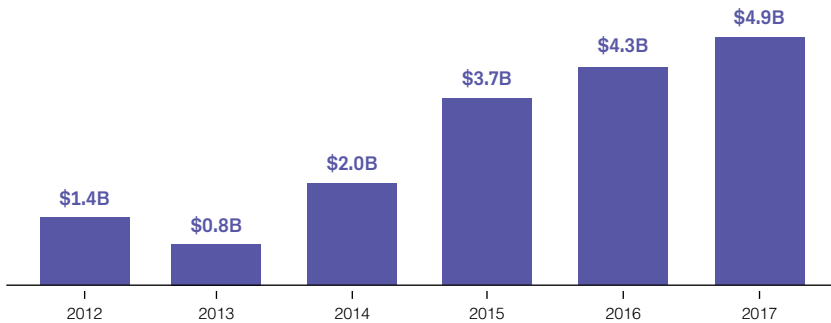


IPOS IN CHINA

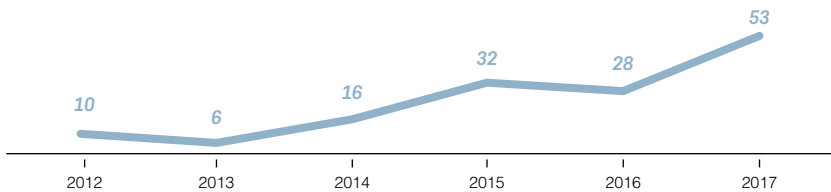
Source: ChinaBio

Total IPO Funds Raised by China Health Care

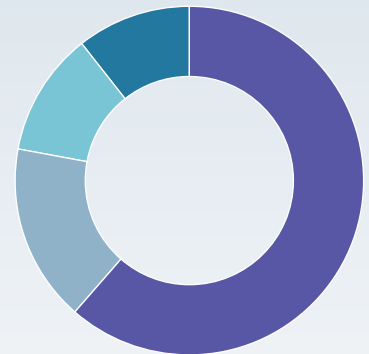
Average IPO size drops to \$92M



Total Number of IPOs in China



Breakdown: IPO Value by Sector in 2017



	AMOUNT
● Drug	\$31.B
● Service	\$776M
● Diagnostic	\$539M
● Device	\$454M

Companies, on the other hand, are looking for investors that understand the nature of the biotech industry. Mark Engel, CEO of the biotech Phagelux, explained: “Phagelux likes sophisticated investors that understand the biotech industry. As a company evolves and experiences several rounds of financing, uneducated biotech money does not promote sustainable growth. An investor that understands the risk profile of the company carries great significance because they add value and credibility.”

OrbiMed Asia, BVCF, and C-Bridge Capital are just a few of several healthcare-dedicated investment firms that have teams trained in health and life sciences, many of which are among the returnees that gained experience navigating the capital markets in the US biotech industry. “Entrepreneurs want investors that understand their language and can bring real resources and knowledge to them, and we can add value in that way as well,” added Wang.

Mergers & Acquisitions: Driving Innovation through Integration

Globally speaking, there has been a trend towards large companies buying innovations rather than taking on the risk of early stage discovery in-house. High profile cutbacks on investment in China from pharma giants like Eli Lilly, GlaxoSmithKline, and Novartis, which all reduced research capabilities in recent years, support this observation. In combination with the government’s drive to consolidate the industry, the environment is ripe for a rise in M&A activity. Dr. Xu Jia, PwC China healthcare and pharmaceuticals consulting leader pointed out: “As the majority of the players in the market are focused on manufacturing common generic drugs, the government introduced favorable policies that encourage local companies to produce different, innovative products, which has led to more acquisitions.” Furthermore, M&As allow domestic Chi-

nese companies to both expand their presence overseas and build their development and manufacturing capacities within the domestic space. In 2016, Fosun Pharma strengthened its position in India through its acquisition of Glad Pharma for US\$1.3 billion and China Resources, one of China’s leading distributors, acquired Genesis Care to expand in Australia through a US\$1.3 billion deal. “We work with several clients that are targeting such companies — domestic and foreign — for acquisition. As taking the plunge into the global market requires navigating a complex legal environment, many of these companies have retained a primary focus on the local market, which is still characterized by strong growth,” Dr. Jia added.

M&A activity can also improve China’s distribution sector. “In a mature market like the US, top distribution companies occupies over 90% of total market share, but China is equipped with thousands of distributors,



The opening of the Hong Kong Exchange allows the possibility of IPOs, which also opens access to public financing. Previously, biotechs in China did not have an exit. Pre-revenue companies can now complete their IPO on the Hong Kong Exchange to access capital. Overall, the big gap that existed between China's healthcare and biopharmaceutical industry and that of the United States and Europe is narrowing.

- Shoufeng Li,
CEO,
Aucta Pharmaceuticals

34



and in this fragmented market there is much fluctuation among the ranked positions: in 2016, the top 100 distributors of China occupied 71% of total distribution revenue compared back to 2013 when it was 64%," said Yvonne Wu. "This is evidence that industry consolidation is in motion."

In a recent report, Deloitte China highlights that while the number of deals in the pharmaceuticals industry has dropped in the past few years, the average deal size has increased, which can be attributed to growing maturity among market players as well as the successful consolidation of the industry; there are simply less players to be acquired.



Going Public: Opportunities in Hong Kong

In mainland China, no stock exchange currently allows biotech companies to list, or in fact any pre-revenue company that cannot demonstrate profitability for three straight years. "Valuation is still based on a PE growth model, meaning those companies listed in domestic markets are still quite sensitive about their profitability," elaborated Felix Fei, EY's partner and co-leader for the life sciences. "Investor education is therefore a very important topic for the development of a mature biopharmaceuticals ecosystem," he added.

However, recent reforms to the Hong Kong Stock Exchange have presented a game-changing opportunity for China's fledgling biotech sector. Relaxed regulations will now allow biotechs to list and gain access to the public market. Hangzhou-based Ascleptis Pharma became the first biotech to take

advantage of the opportunity, filing an IPO in early 2018. The company's Danoprevir drug has already completed phase three clinical trials and is expected to launch later this year as the first cure for hepatitis C to be developed in mainland China.

Many companies are gearing up to follow suit, but there are some fears among the industry that China's markets are not quite ready for the high risk paradigm of investing in drug discovery efforts. "When the Hong Kong stock exchange opened its doors for biotech companies, there has been concern expressed that the first round of inevitable failures from the top 20-30 companies will result in collateral damage for the entire industry," said Fei. "In the US, where the likelihood of failure is more understood, the individual company's share price will be affected, but it does not impact the entire industry which demonstrates the advantages of that sophisticated investor base."

Dr. Zhi Yang, founder & managing partner of BVCF, the first US dollar denominated fund focused on healthcare in China, elaborated on how his firm is adjusting its strategy for this potential fallout. "China has the advantage of being able to study the biotech life cycle in the US. If you compare biotech in the US to the early days of Silicon Valley, similarly there was much failure and disappointment that caused the industry to check itself," he said. "Hong Kong will see this same hype and excitement, and that is good; it will give the whole industry a kick. However, after this first wave and the first round of failed clinical trials, there will inevitably be fallout. With that in mind, we do not see now as a good time to invest, but rather the moment to wait." ■

Yvonne Wu

Life Sciences Managing Partner
DELOITTE



■ **Which are the key service areas that Deloitte offers clients in the life sciences and where is there the most opportunity for Deloitte to further grow its market share?**

Operational efficiency and strategy consulting services are fast-growing areas in China. Domestic players are faced with an increasingly competitive domestic environment, while at the same time looking to capture the potential of overseas expansions. Factors like pricing pressure and regulatory changes represent turbulence experienced by multinationals that will subsequently need stronger market strategy operations and compliance services. We serve both domestic and multinational companies, so our focus on these areas is also growing.

■ **What are the top risks for R&D companies wishing to go public in the Chinese pharmaceutical markets?**

Ensuring a sustainable business model and compliance adherence are the top two areas that pre-IPO companies need to be most concerned about. The pharma market is an investment sector strongly supported by the government, which aims to position China as a hub for R&D in the life sciences, and China has climbed its way up to the 3rd position

in the global R&D ranking scorecard with 33 Chinese life science companies participating in the European Union's Economics of Industrial Research and Innovation (IRI) project. However, small to medium sized companies still struggle to find financial support. Pharmaceutical companies typically have a longer lifecycle with huge investments which is another difficulty they face when navigating capital markets. When an investor evaluates a target company, a product's sustainability in the market and sustainable profitability of the company are key.

■ **How have you witnessed China taking a stronger stance in terms of environmental protection?**

China has been highlighted for environmental negligence, leading the government to enact stringent air quality conservation regulations. The environmental protection tax law is a necessary measure, particularly to take action against pollution hazards causing lung related diseases in China. Enforcement of this measure has made it more challenging for pharma and medical device manufacturers producing low quality products to continue operations, which will promote higher industry standards. ■

35

Dr. Xu Jia

Healthcare and Pharmaceuticals
Consulting Leader
PWC CHINA



■ **How important is the life sciences industry to PwC China at the moment?**

The life sciences are a key strategic sector for the entire PwC network, though especially in China. In terms of spending on healthcare as a proportion of GDP in China, the figure is currently close to 6%. By comparison, in the U.S. the rate is closer to 17%, which reflects there is significant room for further growth.

■ **In recent years, China's life science space has experienced record-breaking activity in terms of IPOs and M&As. What is driving the recent flurry of activity?**

China has developed a strong pharma ecosystem that encourages innovation. The recent trends in IPOs are inspired by activities in Hong Kong in this space. The current regulatory framework emphasises policies that motivate talent to open new businesses that apply the latest technology, thereby attracting investments and more cash inflows. As the majority of the players in the market are focused on manufacturing common

generic drugs, the government introduced favourable policies that encourage local companies to produce different, innovative products, which has led to more acquisitions.

■ **What is your outlook on the future of China's pharmaceuticals industry and what role is PwC China going to play in its future?**

One area in China in which we see a lot of potential is in biopharma, which is well coordinated and advanced, while technology developed here is contributing to the formation of a robust local R&D ecosystem. Concurrent with sector development, PwC has also been making investments in this field, and we have already begun to bear the fruits of our hard work, having recently been awarded the 'Best Business Transformation Partner' in the pharma industry in China. We will continue to play our role, contributing to the growing market and working with the government, multinationals and other key stakeholders. ■



Dr. Zhi Yang

Founder & Managing Partner

BVCF

In 2005, BVCF was founded as China's first US dollar fund that focuses on life sciences and healthcare.

BVCF was founded in 2005. Can you briefly introduce the firm and highlight how you have seen the industry change since your arrival in China?

BVCF is still well-known in China by its original name, BioVeda China Fund, with Veda being the the Indian word for “angel.” However, for branding purposes we changed our name to BVCF to avoid confusion with many companies that operating under the BioVeda term. We are the first US dollar denominated fund, and we came to China with the sole intention of investing in healthcare companies. During our 13 years in the country, the investment landscape and pharmaceutical industry in China has undergone immense change. Evaluating the top five listings each year in terms of sales, profit, and market occupancy is illustrative of the changes we have witnessed. Initially, the top 10 was dominated by multinational and SOEs, or Chinese big pharma. In 2010 the private sector began to gradually replace these bigger players because while the SOEs had sizable sales, they were not adapting to the new direction of the whole industry. This healthy increase in competition from the private sector is forcing the SOEs to take on more R&D projects.

BVCF invests across an array of areas in the healthcare industry, including big data. Can you provide some insight into the trends you're seeing in this area?

We invested in medical big data very early on in two specific areas: genomic and medical big data, the latter being more focused on keeping track of patient records with the objective of using machine learning to help doctors make better diagnosis and treatment plans. Eventually, we believe genomic big data will allow us to better understand inherited diseases patterns and the genetic tendencies associated with certain diseases, which will allow for better treatment on the prevention side. We have also invested in an AI big data company that uses an advanced algorithm to read medical imaging, and we believe the current applications of this technology are just at the tip of the iceberg.

How does BVCF differentiate itself as a firm?

Our fund is dominated by scientists, and that means we are more science than industry driven. This expertise allows us to be constantly looking ahead of the game to see the latest trends globally. Timing is also an absolutely critical skill in the investment world: if you invest too early, you will struggle because there is a specific point when science becomes good business; if you invest too late, you will not see a return. For example, in China, we are the first VC fund to invest in CAR-T technology, and our scientific experience allowed us to see this opportunity and invest at the right moment.

How far have investors in China come towards understanding the risk of investing in innovation-driven projects?

Innovative Chinese companies can list on the US markets, but that still presents challenges such as the language barrier. The big opportunity to continue driving China's innovation will be Hong Kong's recent revisal allowing pre-revenue companies to list. Having witnessed firsthand the evolution of the US biotech industry, I believe the trends in China's capital markets closely resemble the landscape of the US biotech scene in the early 1980s: In the US at that time, there was initially high hope for biotechs, but by the 1990s and early 2000s, biotech had become a dirty word in the investment community. In 2009 when the whole biotech industry became a boom market and the landscape changed again in favor of innovative companies. The lesson that hopefully China will learn from the US is that early on, there will be failure and disappointment, which will result in ups and downs.

Within this climate, what will BVCF's strategy be going forward?

We do things differently from most funds in that we are contrarian thinkers; most people are gearing up to invest, but we are preparing to exit. You have to know the pulse of the industry, and it is not the time to invest; it is the time to wait. Our fund always maintains the strategic decision to invest low — even in very good companies — to avoid participating in the herd mentality. ■



Jonathan Wang

Managing Partner
ORBIMED

From biopharmaceuticals to medical devices, diagnostics, and healthcare services, OrbiMed scouts the globe for innovations that will help ensure humanity lives healthier, longer and more productive lives.

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OrbiMed is a healthcare and life sciences dedicated investment firm with a global presence. Can you briefly introduce the company and its presence in China?

Worldwide, we manage roughly \$14 billion, and as such we believe we are the single largest fund in terms of assets under management in our field. About \$2 billion are invested in Asia-related companies, and our focus in the region began 11 years ago when I initiated our first investments in Asia. We invest in both private and public equity in these markets, and we have three PE/VC funds whose combined assets total \$1.1 billion while the rest is invested the stock markets. Worldwide, we have invested in about 500 companies, and that number is close to 50 in Asia.

How does OrbiMed provide support for the companies in which it invests?

Because we are among the oldest and largest, we are very different from most investors. I do not know of another firm that has a portfolio of 500 companies around the world -- this is a very deep and wide network we can offer. This is important because China as a country is extremely hungry for foreign advanced technology and products. It takes 10-15 years to develop a drug, and China's market does not have the time or capacity to develop the drugs to meet the growing market demand from end-to-end. We scout the world to import and in-license established and advanced products. One of my portfolio companies, Zai Labs, is a leader in this respect. We help companies like Zai Labs access our worldwide network of products and technologies, and we have experienced much success through this model. Additionally, our entire team is trained in health and life sciences. Entrepreneurs want to investors that understand their language and can bring real resources and knowledge to them, and we can add value in that way as well.

When evaluating a potential investment, what are the key components you consider to be most important?

Each investor has different interests and criteria. First and foremost, I pay attention to the people. The leader needs to be very sensitive to markets in addition to

science and technology. Many times, individuals will not pay adequate attention to both of these areas, especially when it comes to scientists that know much about their field of research, but do consider market needs and medical practice. You also need people with a global view and local access to resources. Some top level people have good awareness of what is happening worldwide, but do not know how to work with local governments, or hire talent locally. We also want to see a solid pipeline that strikes a balance between market needs, certainty of the pipeline, and an attractive cost-time scenario. Because the market has been growing very rapidly, fulfilling medical needs remains an important focus. You cannot take advantage of the market growth today with highly innovative technologies that are far from being brought to market. Having products that are close to the market within the pipeline as well as more innovative, perhaps first-in-class assets is an attractive combination.

What is your vision for OrbiMed and do you expect you will adapt your investment strategy in the next few years?

Young companies developing drugs created in China for the world is our focus. OrbiMed Asia will react to market opportunities so there is no fixed path, but there are some trends that will continue driving our direction. Our focus on innovative content will continue to grow because historically in these markets there have not been many opportunities to invest in innovation. In our portfolio we have many growth stage companies that have mature products that sell very well and report revenue earnings. These companies capture market growth opportunities, but more and more we are putting weight on innovation. In terms of technology, there are certain places we are paying more attention to. In biotech, biologics, antibodies, bi- and tri-specific antibodies, antibody drug conjugates (ADCs) fusion proteins and so on are areas where we are paying a lot of attention. We invested in several companies in the immunoncology space where we are seeing many revolutionary technologies appearing. Genomic related areas and precision medicine are also hot places where we will continue to search for opportunities. ■



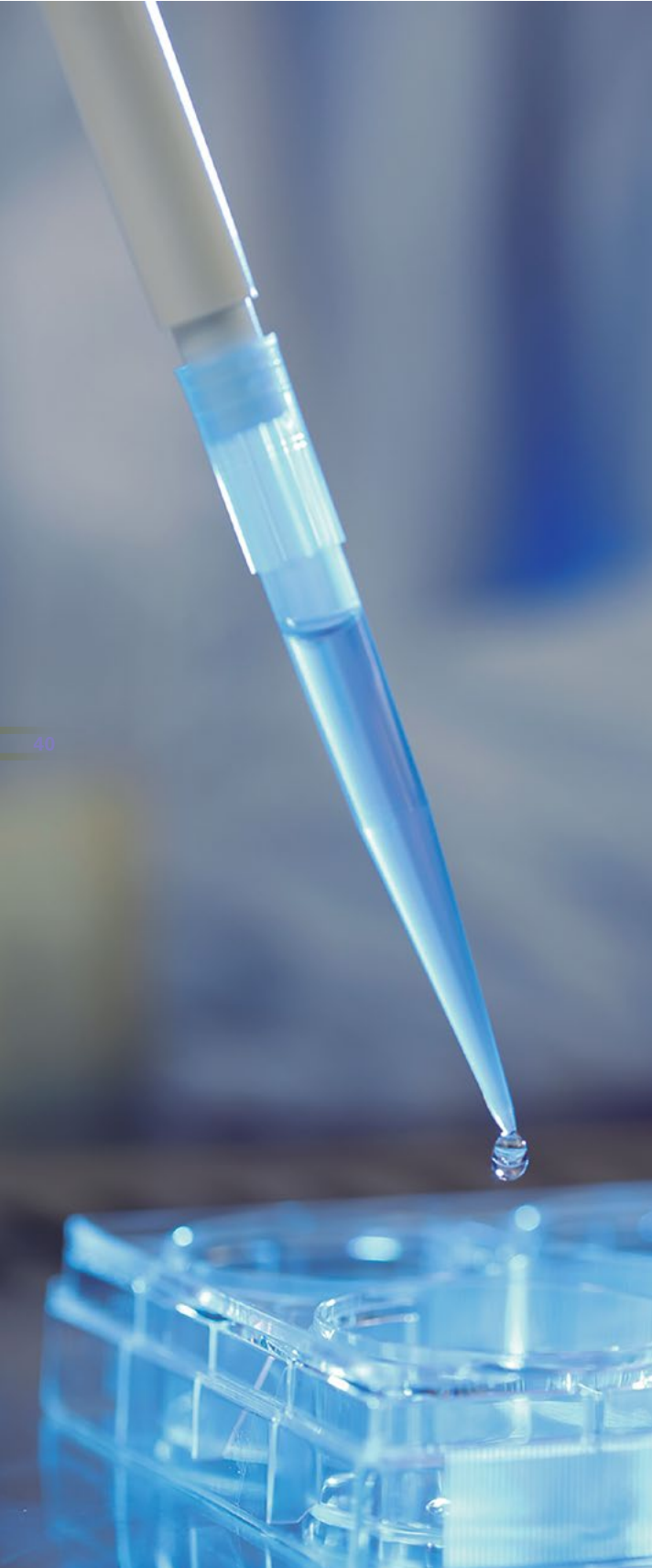


R&D: Is Innovation Really Happening?

"With the highest concentration of medical R&D resources in China, including science parks, universities, medical schools and other institutions, such as accelerators and incubators, and significant R&D talent, Shanghai is set to transform itself into a major global hub for healthcare-related entrepreneurship and has led Shanghai to be ranked high among global cities for its potential for future innovation."

- Mingde Xia,
Senior Director, New Ventures Greater China,
Johnson & Johnson Innovation, Asia Pacific

Image courtesy of 3SBio



R&D: Is Innovation Really Happening?

In 2015, Tu Youyou became the first Chinese scientist to win a Nobel Prize for research conducted in China for her efforts that led to the discovery of the anti-malarial active ingredient artemisinin, which steered to the development of the injectable drug called Artesunate by Guilin Pharma in 1978. Inspired by Traditional Chinese Medicine (TCM) and characterized by low toxicity, fast action, and high efficacy, the Artesunate tablet was later introduced and would become the first innovative finished Chinese pharmaceutical product to pass the onsite inspection of the WHO pre qualification program in 2010 following its acquisition by Fosun Pharma in 2005. Guided by Fosun Pharma's innovation and internationalization approach, Artesunate gained international recognition as "China's No. 1 New Medicine" and has saved an estimated 20 million lives. However, since the Artesunate phenomenon, China has yet to introduce another blockbuster drug with such commercial-relevance to the globe. The country's push to innovate has captured the attention of the world as its pharmaceutical market rocketed up to the number two spot, but the question everyone wants to know is, is it, or isn't it about to make important discoveries?

Generally speaking, the US has long been the global leader in research and development (R&D), producing over half of the world's

new molecules in the past decade. Conversely, China has traditionally been recognized as a “me too” and “me better” market, emphasizing low profit margins rather than high-risk drug discovery. Many argue that, despite the government’s intense focus on becoming a worldwide powerhouse in the science and technology fields, China’s R&D sector remains underwhelming and underperforming on the global stage.

However, drug discovery does not happen overnight, and China’s innovation shift is relatively recent. If the average drug development life cycle takes 10-15 years, and China has spent the better part of the past decade making much needed improvements to the necessary foundational elements for innovation to occur, it is only logical that innovative pipelines will need a few more years before we begin to glimpse the fruits of the industry’s efforts.

Furthermore, there is evidence to support the notion that innovation is indeed a-buzz within China. China’s National New Drug Innovation program saw, during the period from 2011 to 2015, a total of 323 innovative drugs approved for clinical research, 16 innovative drugs approved for production, and 139 new chemical generic drugs entering the market. In 2017, Chinese pharmaceuticals obtained FDA approvals for 38 generic drugs, which was up from 22 in the previous year, and China’s new CFDA classification system reveals a promising focus on innovative drugs. The number of class 1.1 innovative drugs has grown from 22 drugs five years ago to over six times that number today. Looking at all of the drugs under development in China presently, including those in phases one, two and three of clinical trials and pre-clinical, there are roughly 800, with an approximate 50/50 split between clinical and pre-clinical. This number is up from 240 in 2012, and globally, 800 represents around 6% of drugs worldwide, which was previously at 3%.

The shift in innovation may initially originate from a best-in-class start as companies leverage their capabilities to improve existing innovations, before beginning to shift towards first-in-class compounds. Nonetheless, some movement in this space is already on the rise. “In the past, there was a lot of emphasis on the “me too” model in the project pipelines. Now many have best or first in class projects. There is a new sentiment felt among the Chinese pharmaceutical community that if you want to survive, you must innovate,” said Dr. Jijun Yuan, vice president of Genechem, a CRO with drug discovery ambitions and a potentially first-in-class target. “Many companies are looking to list on NASDAQ or Hong Kong,

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We believe this is only the beginning of the innovation period, but based on the progress in the past 5-10 years, we will become a powerhouse in the global industry because we have the patients, samples, and support from national funding that will allow us to compete.

- Dr. Jijun Yuan,
Vice President,
Genechem



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which is a further testament to the high level of innovation we are seeing in China,” he added.

International companies tell conflicting accounts of China’s ascendance to an innovation-focused market. Indian law firm LexOrbis specializes in IP protection, and has spent several years scouring China’s pharma market for potential clients that may benefit from their legal expertise when bringing their innovations to India, but to date has been unimpressed. “Most Chinese companies that are filing applications in China have not taken full advantage of international markets, and many of our peers in the US have expressed the same opinion that while there is some buzz in the area of biologics and biosimilars, not much is happening in the small molecule segment,” said Dipak Mundra, partner at LexOrbis. “Many of the patent applications have been focused in areas of technology such as telecommunications, software and mechanical. This suggests that the biopharmaceuticals industry is still very early stage, and it will take time before tangible results begin to emerge.”

As Mundra highlighted, it is indeed time that may be the relevant factor in these observations. In contrast, the international clinical trials sector has seen encouraging movement in their business from Chinese companies, particularly those in nearby Australia. “We

saw an opportunity in China about 18 months ago based on clients coming to Australia for trials... China clientele now represent over a 1/3 of our business with the US being the other key market. Our US clients are growing rapidly, but China is far exceeding its pace," noted Jayden Rogers, VP global partnering for Linear Clinical Research, a Perth-based specialist phase one clinic. "The interesting trend we have observed is the type of work that is coming from China. Previously, you would not have called what we saw from China particularly novel; it was bioequivalency studies and more generic focused. We are now seeing some of the most cutting-edge innovations coming from China, and we are in a fortunate position to witness the forefront of this innovation through our clients." The case study of Artesunate is a undoubtedly a watershed moment in Chinese pharmaceutical history, representing a move from "Made in China" to "Created in China." However, the case also well-demonstrates that it will take some time for new innovations to take the market by storm. Nonetheless, China's pharmaceutical industry, from biotechs to small molecule and multinationals to China's big pharm companies, are all intently focused on contrib-

uting to the government's vision for a healthier China that plays a leading role global R&D efforts. As Wu Yifang, CEO of Fosun Pharma, pointed out when asked about the company's many CSR initiatives: "As a pharmaceutical company, our most important social responsibility is innovation. There are so many unaddressed medical needs, and we must work hard to solve these problems."

Biopharmaceuticals: The Future of Innovation

Around the world, the pharma industry is increasingly oriented around large molecule research. China is no different, and while TCM and small molecules will remain important to the market for many decades to come, much of the innovation in the country is centered around the potential in the biopharma space. "Every industry experiences a peak and then a dying period, and we have witnessed many of those. Pharma has been traditionally focused on small molecule research, but I believe this area is already over the top because we have discovered that proteins are more precise and

42

Cell Signaling TECHNOLOGY

PTM Antibody Company of the Year

Dr Chalmers said: "Cell Signaling Technology has been built around these types of antibodies and our data shows that the company has developed its product to the point where it is now the clear leader in the PTM antibody market."

More info: www.citeab.com/awards

2017 AWARDS CiteAb WINNER CELL SIGNALING TECHNOLOGY RESEARCHER'S CHOICE PTM ANTIBODY COMPANY OF THE YEAR

About CST
 Founded by research scientists in 1999, Cell Signaling Technology (CST) is a private, family-owned company with over 400 employees worldwide. Active in the field of applied systems biology research, particularly as it relates to cancer, CST understands the importance of using antibodies with high levels of specificity and lot-to-lot consistency. That's why we produce all of our antibodies in house and perform painstaking validations for multiple applications. And the same CST scientists who produce our antibodies also provide technical support for customers, helping them design experiments, troubleshoot, and achieve reliable results.



China's startup ecosystem is booming, and we look forward to working with the many enterprising innovators in the region that are working to turn science into tangible, commercial products.

- Mingde Xia, Senior Director,
New Ventures Greater China,
Johnson & Johnson Innovation, Asia Pacific



typically easier to handle. Biopharma is the area where we are seeing many of the current breakthroughs,” explained Dr. Zhi Yang, founder and managing partner of investment firm BVCF.

Big multinational pharma companies have largely been scaling down investments in their in-country capacity, including GSK, Novartis, and Eli Lilly, which all shut-down or cut resources for their respective R&D projects in China according to Bloomberg. However, this is not necessarily an indication that these giants do not see potential in China's R&D sector, but are rather following the global trend towards buying up innovations, with a particular interest and focus on China's fledgling biotechs.

Cross-border deals curated by ChinaBio demonstrate the buzz from multinationals and US-based companies in China's biopharmaceutical industry. Notably, BeiGene and Celgene in-licensed and out-licensed several drugs in a record-breaking US\$1.4 billion deal. Janssen Biotech, a J&J subsidiary, in-licensed a CAR-T candidate from Nanjing-based Legend Biotech, a subsidiary of GenScript, with the intention of developing cell therapy for multiple myeloma. In September 2017, Amgen partnered with Simcere to develop four biosimilars. HitGen agreed to a collaboration with Boehringer Ingelheim to identify novel leads, while Xynomic in-licensed a RAF inhibitor from Boehringer Ingelheim in a US\$502 million transaction. Many Chinese companies are also looking overseas to bring innovative technologies into China for development of its biopharma space. Zai Labs, a leading Chinese biopharmaceutical company, has a stated commitment to forging alliances with global partners with the objective of developing an innovative biopharmaceutical pipeline in China. Currently, the company has relationships with names including Tesaro, Sanofi, GSK, Paratek and Bristol-Myers Squibb. Zai Labs' near term focus will be to develop and commercialize an innovative biopharma pipeline, and the company intends to further expand its own drug discovery capabilities.

While many companies are currently taking the approach of sending their S&E teams to explore the different opportunities in Chi-

na's biotech space, many others are taking a step further by investing in its development. For example, in 2019, J&J will introduce its JLABS incubator platform, representing the company's first overseas expansion of this model outside the US. The program in Shanghai will host up to 50 different start-ups and will provide participants with the facilities, network and expertise offered by the J&J enterprise. “JLABS @ Shanghai will help build on and catalyze the region's current culture of innovation and entrepreneurship to ultimately deliver novel therapies for the world's patient population,” said Mingde Xia, senior director for J&J Innovation Asia Pacific's New Ventures Greater China program. “We are confident that JLABS @ Shanghai will support a vibrant ecosystem of start-ups and entrepreneurs with access to the world-class expertise and technology within our global network.”

Pushing to compete with multinationals, China's pharmaceutical companies, like giants Shanghai Pharmaceutical Holdings (SPH) and Jiangsu Hengrui Medicine, have been quick to join the biopharmaceutical game as key to their innovation strategies. 3SBio, a Chinese biotechnology company founded in 1993 with a broad focus on biopharmaceutical products, highlights the advantage of its large molecule emphasis: “The policy of “Healthy China” accelerates the development of the biopharmaceutical industry. 3SBio sees the opportunities that innovative drugs are expected to receive more government support and drugs with proven efficacy and superior clinical benefits at competitive costs are more likely to be covered by reimbursement,” said Lou Jing, CEO of the company, which already has seven approved biologics on the market.

3SBio has support from the National Important New Drug R&D program under the 13th 5-Year Plan and, as of late 2017, had 16 out of the 31 assets in its pipeline classified as National Class 1 Drugs across areas including oncology, immunology, nephrology, metabolic diseases and dermatology.

Fosun Pharma, a top five Chinese pharma company founded in 1994, has R&D platforms that include 131 assets in the pipeline

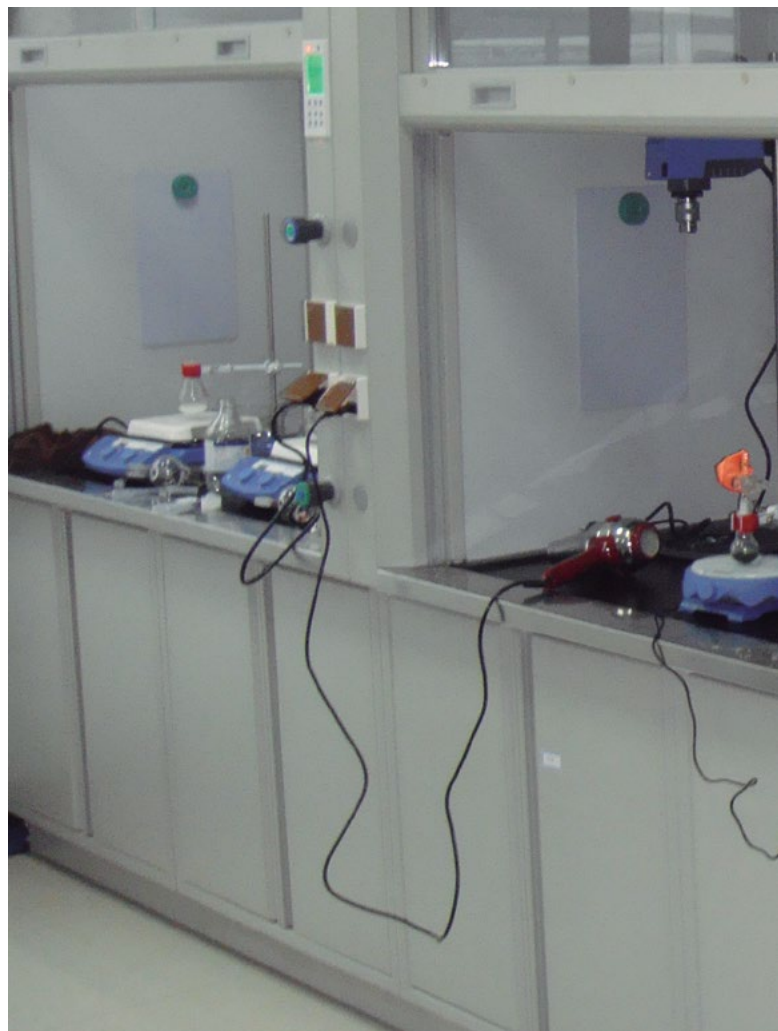


There have been several large investments into research & development facilities made by the big pharma companies and we are expecting impressive results to follow suit. There has also been an observable focus in biosimilars and biologics in China, and we would like to capture that initial momentum by helping our Chinese clients to protect their innovation in India. Biosimilars are the future of therapeutic treatment and, going forward, we see Chinese companies using India as a key market to exploit their products through the retail chain that has been established by China's penetration of India in the small molecule space.

- Dipak Mundra,
Partner,
LexOrbis



44



across innovative chemical drugs, biologics (biosimilars and innovative projects), generic drugs, and cell therapy. Although Fosun operates across the entire health care value chain, with ventures extending from the joint-founding of China's largest distributor Sinopharm to an interest in energy-based aesthetic medical and minimally invasive treatment systems through its successful Sistram Medical subsidiary, the company has also maintained a critical focus on broadening its attention towards biopharmaceuticals: "In 2009, when most Chinese pharmaceutical companies were focused on the generics business, we placed our emphasis on innovation," said Wu Yifang, CEO of Fosun Pharma. "At the time, Fosun Pharma founded Shanghai Henlius Biotech with scientists returning from the US, and the company has grown into a unicorn that has been leading the way in biosimilars and innovative biologics, especially in monoclonal antibodies."

In early 2018, Henlius signed a license agreement with American company Galaxy Biotech for novel monoclonal antibodies (mAbs) targeting the Death Receptor (DR) pathway, authorizing Henlius the excessive rights to the products in the greater China region, with the option to extend the licensed territory to the entire world. Additionally, Henlius' first three novel mAbs have received approval from the CFDA for clinical trials.

Driven largely by the returnees, China's booming biotechnology sector is quickly filling with exciting projects, many of which will begin to come to market in the next three to four years. Several of these companies have already listed, included Zai Labs, BeiGene, Hutchison, and WuXi Biologics, while several others are very close to taking their companies public. Innovent Biologics, a leading biotech company with currently 16 molecules in research, is meant to launch an IPO later this year as well as Hua Medicine, which is focused on diabetes drugs and expected to list at US\$400 million in Hong Kong. In the next section, we will introduce some of the key areas of focus in China's rapidly growing biotech space.

Hot Themes in China's R&D Pipelines: Cutting-Edge Approaches and Technologies

Several key factors are driving interest in different areas of research. Meeting unmet medical needs is of course a critical focus throughout the pharmaceutical industry, but in China's increasingly competitive R&D sector, there is also a need to differentiate and distinguish pipelines, whether through a novel approach, target, or technology platform.

Image courtesy of Cool Pharm



Precision Medicine is an approach of growing importance, particularly in oncology as targeted treatments for patients become more popular and better-understood. 3D Med, a leader in China's precision care space, has developed a kind of PD-L1 by subcutaneous administration that is the only one of its kind worldwide. Dr. John Gong, CEO of the company, elaborated on why precision medicine has begun to garner so much attention: "In 2015, former President Obama addressed congress to announce an initiative to emphasize precision medicine. China reacted very quickly, announcing just four months later the Chinese version. However, the investment in the US was only US\$5 billion, whereas in China the government dedicated around double that amount. Since then, precision medicine has been very popular in China and many companies in this area have received government funding," he said.

The increase in the popularity of precision medicine correlates with better diagnostic capabilities, which have specifically aided in better defining cancer markets. With between 4-5 million new cancer patients in China each year, oncology remains a critical area of therapeutic focus. Within China's biotech space immunotherapies, and particularly immuno-oncology, have been hot areas for research in line with global clinical trial data that says 44% of trials on immunotherapies are in the oncology space.

Together with precision medicine principles, the potential for CAR-T cell therapies is of particular interest in the immuno-oncology segment. According to PharmExec, in March 2018, Nanjing Legend was the first to be granted clinical trial approval for CAR-T, and Bloomberg reports that globally 1/3 of trials in this space are in China. However, while CAR-T is a hot area that will continue to garner investor interest, the high-risk nature of this early stage research area will also present challenges. "CAR-T is a personalized treatment that works for some tumors, but it is very expensive per person per treatment," added Gong.

3D Med is currently collaborating with Alphamab to develop a PDL antibody that will come in injectable form, the first of its kind in the world.

Leveraging its proprietary Fabs-In-Tandem (FIT-Ig) technology, EpimAb Biotherapeutics has a pipeline focusing on three key areas: second generation target therapy, the next generation of molecules in immuno-oncology that addresses patient response and resistance mechanisms, and T cell engager mechanisms, which is similar to CAR-T, but uses a bi-specific approach as well as the new generation of CD3 and NK-based engagement mechanisms. The company's CEO, Dr. Chengbin Wu, highlighted the difference between CAR-T: "They are based on the same mechanisms of ac-

tion but with very different approaches. For bi-specific, the T-cell engaging mechanism is one of the many mechanisms of actions that bi-specific can do but CAR-T is only doing the T-Cell engaging mechanism. In terms of areas of application there is a huge difference. With this particular mechanism the advantage of bi-specific is that you can develop a common pharmaceutical drug that can easily be given to patients without retrieving T-cells, allowing for more general application. In China in the current stage, the commercial outlook for developing CAR-T therapy is still in its early stage because you have to rely more heavily on healthcare institutions. The bispecific approach will also need to overcome several hurdles to develop longer lasting, more effective therapies with a better safety profile,” he said.

While cancer will remain a focus for the foreseeable future, organ degenerative disorders are another important focus that aligns with the need to address China’s aging population. Neurodegenerative and cardiovascular disease areas are hot topics of research and a focus for China biotech Zensun. The company recently raised US\$76



This market is quite large because currently there is no single curative therapy for heart failure. Worldwide, heart transplantations are the only option and in the US only about 2,000 to around 2,500 take place each year. In China that number is only 250 to 300, which is even more striking when you compare the differences in population. The market is therefore huge in China, which has driven our focus. In the future, we will look at opening more pipelines depending on investments and the size of the team.

- Dr. Jiaxian Wang,
CEO,
Help



million with the objective of taking its lead candidate through the final stages; Neucardin, a heart failure drug, reverses the myofibril disarray to increase heart function.

In addressing organ failure-released diseases, the opportunity to pioneer into the uncharted waters of stem cell therapy has been traditionally under explored. “The nervous and cardiovascular systems are the only two that will never regenerate alone, and this is where therapeutic treatments have a real opportunity to make a difference,” said Dr. Jiaxian Wang, CEO of Help, a company focused on Stem Cell-based regenerative therapies that is currently developing regenerated clinical-grade human heart muscles.

However, it is in these newer areas of research focus, like stem cell therapy, that China is well-positioned to make an impact and maybe even surpass the US in the research process. “The US and China are both racing to introduce new developments in technology, but their respective regulatory environments are very different,” explained James Irwin, life sciences managing director for Accenture China. “China has a lot less red tape in certain areas such as stem cell research, and limited regulations in place when it comes to AI, which presents an opportunity for them to take the lead.”

China’s strength at the moment is more on the development side of R&D, however, its discovery capabilities are only growing stronger. In progressive areas like stem cell research, as well as gene therapy, where there has been little emphasis globally, China has the opportunity to take advantage of an even playing field. With an ever-increasing stockpile of innovative technologies and a growing network of talented scientists intently focused on innovation, it will merely be a matter of time before China begins to produce some of the most cutting-edge drugs. Until then, we discuss in the next section of this publication the importance of boosting the capacity of its innovation ecosystem towards accelerating this objective. ■

GENE
吉凯医药

**BETTER THERAPY
FOR BETTER LIFE**

Shanghai Genbase Biotechnology Co., Ltd. was established in 2016, with a focus on developing new therapeutic drugs to solve the unmet medical needs in China.

Genbase develops new therapeutic drugs by working closely with doctors and using clinical samples/clinical database during the research. Genbase specializes in China's high-incidence diseases including tumor, diabetes, cardiovascular diseases, and focuses on drug development in cell therapies, gene therapies and antibodies.

Genbase is determined to be the leader in providing a series of therapeutic products and solutions to help the Chinese patients.

www.genbase.com.cn



Wu Yifang

CEO

FOSUN PHARMA

Fosun Pharma is one of China's leading healthcare groups and is committed to becoming a first-tier enterprise in the global mainstream pharmaceutical and healthcare markets.

Fosun Pharma has been operating in China since 1994, and in 1998 became the first private company to go public on the SSE. Can you highlight the key milestones in the company's history?

Listing on the SSE presented us with an excellent opportunity to gain access to capital that we then used to begin a series of acquisitions. Those acquisitions established a strong foundation for our future developments. In 2003, Fosun Pharma cofounded Sinopharm, which has become the number one pharmaceutical and health-

care products distributor in China and is a globally influential player. In 2009, when most Chinese pharmaceutical companies were focused on the generics business, we placed our emphasis on innovation. At the time, Fosun Pharma founded Shanghai Henlius Biotech with scientists returning from the US, and the company has grown into a unicorn that has been leading in biosimilars and innovative biologics, especially in monoclonal antibodies.

Can you highlight the strategic approach that Fosun Pharma is taking in its R&D activities?

Our innovation strategy will focus on technologies that will address unmet needs in disease areas without any cure at present, such as oncology, autoimmune diseases, some rare disorders and degenerative diseases. Additionally, we have built up certain advantages in biotechnology, and in the future we will focus on using advanced technology platforms like monoclonal antibodies, immuno-oncology, stem cell therapy and gene editing technology to address these areas of unmet needs.

Can you highlight the key markets where the company intends to grow and how you intend to expand?

18.25% of our revenue came from overseas business in 2017, representing a growth rate upwards of 57.88%. By acquisition, we plan to grow in both the US market and the Indian market, which has very significant potential due to its population size. Our focus in international markets has traditionally been APIs, but from this year onwards there will be more formulations, especially in the regulated market. Fosun Pharma is also looking to expand its innovative drugs overseas.

As a company listed on multiple public stock exchanges, what has been your experience navigating the capital markets and how do you expect the investment environment to evolve?

The China capital market is very healthy at the moment; the regulatory environment is undergoing continuous improvement and liquidity is quite good. In the Healthy China 2030 initiative, the government emphasized the importance of healthcare innovation, and if a company can demonstrate a strong commitment to innovation, access

to the capital market is not a problem. In fact, Fosun Pharma is leveraging the Hong Kong stock exchange and SSE to expand our innovative business.

All over the world, opportunities and risks coexist. Chinese people embrace innovation, especially in the pharmaceutical field, we are not afraid of risk. However, the Hong Kong's announcement saying that it will allow innovative companies to join the stock exchange is testament not just to the fact that China has an appetite for risk, but that Chinese society recognizes the need to support innovative drug discovery activities.

Can you elaborate on the importance of social responsibility to Fosun Pharma and provide some examples of its many CSR activities?

Fosun Pharma takes a multi-pronged approach to CSR and has several initiatives to support patients from remote regions in China to all around the world. Within China, we provide support to dialysis patients in the countryside, and we also have implemented a public welfare platform that aims to provide education, training and software/hardware support to rural doctors. Fosun Pharma has also been relentlessly active in the fight to eradicate malaria, which is also an objective of the WHO by 2030. We have provided over 100 million vials of Artesun® (injectable Artesunate) to the African market, which has cured an estimated 20 million patients with severe malaria. However, as a pharmaceutical company, our most important social responsibility is innovation. There are so many unaddressed medical needs, and we must work hard to solve these problems.

Where would you like to see Fosun Pharma in the next 3-5 years?

China has the largest population in the world and, in the future, our country will undoubtedly be one of the biggest pharmaceuticals markets, if not the biggest. Consequently, in the next 10 years, there will be several Chinese companies growing to become top global players with recognizable names worldwide. As one of the leading companies in China, we have ambitions to be among those companies and we will achieve that vision through our focus on innovation and internationalization. ■



Dr. Wu Xiaobing

Country Manager

PFIZER CHINA

Regional President

**PFIZER ESSENTIAL HEALTH
GREATER CHINA**

Ever since entering the China market in the 1980s, Pfizer has been committed to contributing to both the economic development of China and the health of Chinese citizens.

Pfizer China has invested over US\$1.5 billion in China to date and introduced over 50 drugs into the country. How important is China to the Pfizer group, and looking forward what is the company's vision for its presence in this market?

Pfizer has a long-standing presence in China, and has maintained and substantially increased the size of our presence and our investments over the past 30 years. In fact, China is our largest Emerging Market (EM) and remains an attractive growth opportunity as it is still one of the fastest growing pharmaceutical markets in the world. We will continue to work in partnership with the Government to improve patient care in China and we support the Chinese government's policies that encourage biopharmaceutical innovation, accelerate the approval

process of new medicines, and enhance the quality of domestic generics to the international level. We are committed to supporting the Chinese government's stated healthcare goals, including strengthening primary care health services and patient management for chronic diseases. Currently, we are focused on driving our legacy brands portfolio (specifically CV and AI portfolios) and exploring opportunities in the innovative portfolio and biosimilars, along with finding ways to expand reach to more patients, particularly across mid- and lower-tier cities, as well as the provinces.

Increasingly the Chinese government is putting pressure on companies to mitigate their environmental footprint. How does Pfizer China balance environmental responsibilities with achieving optimal operational efficiency?

At Pfizer, we take a collaborative, entrepreneurial approach to sustainability practices that produce measurable value for our business and society, and as such we are fully aligned with the Chinese government's position on limiting the environmental impact caused by manufacturing activities. We aim to use our global presence and scale to address these issues and ultimately make a difference in local communities and the world. We believe that the path toward environmentally sound business practices begins with a better understanding of our environmental footprint, its impact, and how it is changing.

The last decade has seen an expansion of Pfizer China's R&D activity. What has been the most critical driving forces pushing Pfizer and the nation to invest more in this area?

China has seen significant advances in healthcare reform such as the world's largest medical insurance system, rural healthcare coverage, introduction of catastrophic disease insurance, regulatory and public hospital reforms and the recent update to the NRDL that will help increase patient access to quality medicines throughout China. We believe that two key priorities— access on one hand; and innovation and quality on the other— are both vital if China is to continue to make significant strides in the next 30 years in the area of health. We are glad to see that the Chinese authorities have recently issued a series of new policies to

address this “drug lag”, such as encouraging international multi-centered clinical trial application and supporting simultaneous native and international clinical trials. We are looking forward to continuing to partner with all stakeholders to help China successfully balance both innovation and access, modernize its biopharmaceutical sector, and build a vibrant life sciences sector that develops treatments and cures for China and the world.

In early 2018, Pfizer China announced an investment in Chinese biotechnology company NetVation DL Medicine. What are the attributes you consider most critically when assessing potential partners in the Chinese biopharmaceutical space?

We could not advance the pursuit of our mission without partnering with equally dedicated individuals, which is why we are consistently exploring areas that fit our strategic goals that provide value to patients and shareholders. New target ideas and novel chemical matter are critical to our success in bringing new therapies to patients around the world. The collaboration with NetVation and other local partners in China represents Pfizer's worldwide commitment to partnering with companies that are doing innovative scientific work to help enhance our portfolio across multiple disease areas.

Going forward, what is your outlook on the future of the country's pharmaceutical industry and what steps is Pfizer China taking to ensure its clients and partners that its products meet the highest standards?

We place the utmost emphasis on patient safety and product quality at every step in the manufacturing and supply chain process. All Pfizer products released in the market meet every national and international testing specification. Through a global supply network, Pfizer ensures supply of quality products that potentially significantly improve patients' lives, and that these products are available whenever and wherever they are needed. Through consistent high standards for quality, compliance and supply reliability, and by delivering value without compromising quality or compliance, Pfizer's supply network provides fast, flexible solutions across the full manufacturing and supply chain spectrum and delivers safe, effective medicines around the world. ■

Dan Wang & Mingde Xia

DW: Head

MX: Senior Director,

New Ventures Greater China

JOHNSON & JOHNSON
INNOVATION, ASIA PACIFIC



DW



MX

Johnson & Johnson is one of the world's most comprehensive and broadly-based healthcare companies. Guided by the values of its Credo, Johnson & Johnson is dedicated to the aspiration of "caring for the world, one person at a time."

Can you briefly introduce J&J's 35 year presence in China and highlight the opportunities in the market that are driving the company to expand its presence further?

DW: Since the founding of its first joint venture in China in 1985, Johnson & Johnson has been an industry leader in the healthcare market. Through the company's advanced healthcare solutions, Johnson & Johnson helps to bring a positive impact

to the health and life quality of Chinese families. Today, Johnson & Johnson's businesses span three sectors in China: consumer; pharmaceuticals; medical devices. Johnson & Johnson has initiated an accelerated China growth strategy, connecting its global resources to further unify its core business capabilities in the China market. This strategy will further accelerate Johnson & Johnson's pace in creating value through innovation, achieving excellence in execution and leading with purpose, as well as enabling the company to realize its commitment of contributing significant health benefits to the Chinese society.

Can you elaborate on how the JLABS incubator system supports J&J's mission to develop an end-to-end R&D model?

DW: We recognize that health innovation does not happen in any one company and pursue the best science in our areas of interest, whether sourced internally or externally. One key element of our external innovation strategy is the identification of opportunities that might be too early to bring inside the company but that can be nurtured and incubated until it matures. In 2013, we launched our Shanghai-based Asia Pacific Innovation Center with the objective of identifying and nurturing early-stage innovation in China and across the region, and last year announced our plans to open a JLABS @ Shanghai to further support innovators seeking to make the next great breakthrough. JLABS @ Shanghai, which will be co-located with our Shanghai Discovery Center at Zhangjiang Hi-Tech Park, will be part of a global JLABS network of open innovation ecosystems, enabling and empowering innovators to create and accelerate the delivery of life-saving, life-enhancing health and wellness solutions to patients around the world.

Where have you seen the most impact and conversely where do gaps still remain in the government's regulatory reform initiatives?

MX: China's Food and Drug Administration has announced initiatives that accelerate drug approval processes including simplified approval of clinical trials and the expansion of the approval of new categories of drugs. We welcome the positive steps taken by the Chinese Government to foster new models of pharmaceutical innovation and reform the healthcare system and en-

courage the CFDA to implement its broader reform proposals as quickly as possible to further accelerate patient access to innovative therapies. Last year, Xian Janssen and Johnson & Johnson China had 43 products listed on the National Reimbursement Drug List (NRDL), including innovative treatments such as VELCADE for multiple myeloma, SUSTENNA for schizophrenia and ZYTIGA for prostate cancer. Collectively, these medicines are benefiting millions of patients in China.

Can you provide some insight into how J&J envisions the integration of advanced technology into enhanced drug development processes?

DW: We are looking at ways to leverage these technologies to gain insights into diseases and achieve efficiencies in how we design and conduct clinical trials. We are also looking at creating patient solutions that connect genetics and other metrics for individuals with specific diseases, to keep people healthy in ways that would otherwise be impossible. But we know that we can't do it alone, so we are working to identify and partner with the best innovators with the best science and technologies in China and across the region. For example, in December 2017, we entered a worldwide collaboration and license agreement with Chinese company Legend Biotech to develop an investigational CAR-T anti-cancer therapy, which has shown promising results in early-stage multiple myeloma trials.

Why did JLABS choose Shanghai as a base for its new facilities?

MX: With the highest concentration of medical R&D resources in China, including science parks, universities, medical schools and other institutions, such as accelerators and incubators, and significant R&D talent, Shanghai is set to transform itself into a major global hub for healthcare-related entrepreneurship and has led Shanghai to be ranked high among global cities for its potential for future innovation. Shanghai recently topped a list in a KPMG report as the next global innovation hub, in front of New York and Tokyo. Our choice of Shanghai as the first JLABS location outside of North America is recognition of the city's position as a leading center of innovation and entrepreneurship in Asia Pacific and of strong support from the Shanghai Municipal and Pudong New Area Governments. ■

Mr. Lou Jing



CEO
3SBIO

3SBio positions itself as a forerunner and incontrovertible leader of the Chinese biopharmaceutical industry.

Can you highlight the company's vision for how it sees itself evolving as a global leader in biopharmaceuticals?

As a leading biotechnology company in China, 3SBio aims to become a China-based global leader in biologics with the mission of improving the qualities of life of patients by providing high quality drugs and bringing health benefits to the human race. We are the largest biopharmaceutical company with integrated R&D, commercial, manufacturing and investment & alliance platforms focusing on oncology, rheumatology, nephrology, metabolic and dermatology. We are growing international sales through the registration of existing products in new markets and the registration of new products through either innovative or biosimilar pathways in highly regulated markets.

The Chinese government has placed great emphasis on innovation in life sciences, evidenced by investment that has grown by a factor of 10 over the past 10 years. What role will 3SBio's four R&D centers play in contributing to this innovation wave and what further investments does the company have in the pipeline to further enhance its R&D capabilities?

3SBio has an integrated R&D platform including a national engineering research center for antibody drugs and 4 R&D centers with both biologics & chemical drugs platforms. Several projects of the Group are supported by the National Important New Drug R&D program under the 13th 5-Year Plan. As of December 31, 2017, amongst the 31 product candidates within the Group's active pipeline, 16 were being

developed as National Class I New Drugs in China, covering oncology, immunology, nephrology, metabolic diseases and dermatology. The fully integrated R&D platform is accelerating the development of biologics products, thus enabling the Group to provide a variety of treatment options for patients. Additionally, the Group's sound R&D organizational structure enables us to support the registration of 3SBio's new drugs as well as international cooperation, which is highly recognized by American partners. In the future, the Group will focus its R&D on innovative biologics products, supplemented by the development of small molecule and generic drugs.

3SBio saw its 2017 revenue increase by an impressive 33.5%. What key factors are promoting this growth?

The growth is owed to the dramatic increase of sales for core products of the Group, including TPIAO, Yisaipu, as well as recombinant human erythropoietin ("rhEPO") products EPIAO and SEPO. All four products continued to be market leaders in China in 2017. Additionally, with the three products (including two key products) admitted in the NRDL in 2017, the Group is of the view that the NRDL inclusion will benefit these products' penetration in the hospitals under its coverage and allows further expansion of these products in lower-tier cities and hospitals, which also can stimulate market share growth.

As of the end of 2017, 3SBio had 31 product candidates within the company's active pipeline, 16 of which were being developed as National Class I New Drugs

in China. Can you elaborate on the company's current portfolio assets?

3SBio focuses its R&D efforts on researching and developing innovative biologics products. Currently, the Group has a panel of leading biologics products in various stages of clinical development, including NuPIAO (the second-generation rhEPO to treat anemia), SSS07 (the anti-TNF α antibody to treat RA), Pegsiticase (a modified pegylated recombinant uricase from candida utilis to treat refractory gout), 602 (an anti-epidermal growth factor receptor antibody to treat cancer), 601 (an anti-VEGF antibody to treat AMD), and prefilled syringe dosage form of Yisaipu.

Dramatic regulatory reform in China has created a strong policy framework for the pharmaceutical industry, but many say operating in China still presents many challenges. Where does 3SBio see opportunity to improve efficiency in the business environment?

3SBio is growing up with the process of regulatory reform in China. In 2017, the policy of "Healthy China" accelerates the development of the biopharmaceutical industry. 3SBio sees the opportunities that innovative drugs are expected to receive more government support and drugs with proven efficacy and superior clinical benefits at competitive costs are more likely to be covered by reimbursement. The Group is well-positioned to capture vast industry opportunities and intends to reinforce its position as a leading biopharmaceutical company in China by leveraging its integrated R&D, commercial, manufacturing and investment & alliance platforms. ■



Jay Dong

GM and Global VP

CST CHINA

Co-President Academia-Industry Consortium on Innovation and Entrepreneurship

CHINESE SOCIETY OF CELL BIOLOGY

Board Member

MIT CLUB OF SHANGHAI

CST is expanding its footprint across China where R&D and innovation spending is on the rise

CST first established its presence in China in 2008. How have you observed the pharmaceuticals market evolve since then, and how has CST adapted to meet these changes?

Looking at R&D investment in China at the beginning of 2008 as a percentage of GDP, the amount of spending increased from less than 1% to around 2%, and by 2020 we expect that number will reach 2.5%. Riding on this growth, we focused on a few key objectives. We reorganized our distribution network and partnered with leading customer associations such as the China Cell Biology Society, which is a leading association of scientists in our field. We have intensely focused on increasing our delivery speeds.

We began expanding our operation in China in 2009 in Shanghai, followed by Beijing in 2012, because our customers are conducting the same or even more advanced research here as in the U.S. Those that have worked with us in the United States asked why they are not also able to receive their product as soon as the next day in China. This country is enormous, which makes it geographically challenging, but in Tier 1 cities like Beijing and Shanghai, there is no reason we cannot deliver a solid service to our clients, which is why we have local stock that we have been gradually increasing over time.

What do you believe are the key external factors driving the push towards innovation within the China pharmaceuticals space?

By 2050, the age distribution in China will be highly skewed because of the One Child policy. Based on data presented by UN Populations Division MIT AgeLab 2010, it is expected that the population of individuals over 60 years of age will reach 437 million. Maladies like cancer, cardiovascular disease, and neurodegenerative diseases such as Alzheimers and Parkinson's are just a few of the age-related health problems that will increase. A second component is that China wants to be known as an innovation economy rather than a low-value, export-driven economy. This is a driver for our market because government wishes

to address both the issues of an aging patient population, and also to up-grade the technology available here by incubating more companies and services, and the life sciences represent an intersection of those two objectives.

To what extent is CST active in conducting its own R&D activities?

We consider ourselves the scientists for scientists. For example, through our work in the lung cancer space we discovered eml4-ALK fusion protein in a small group of non-small cell lung cancer, which represents about 80% of lung cancer occurrences. We observed individual differences that are genetic-related in lung cancer and differentiate one group of patients from another through a target called ALK that some have and others do not. This discovery enables scientists to develop more targeted therapy, which allows for more impactful response within patients. From this effort, we enabled Pfizer to develop a drug that targets eml4-ALK and was subsequently FDA approved without a phase three trial.

As China continues to develop as a hub of pharmaceutical innovation, what role will CST play in helping to secure its future as global leader?

We experienced great success with our expansion, and we expect to expand further as we are confident that the future is bright in China. There are many geographic regions we need to serve and to serve better. Finally, there are many young scientists in China, and we see an opportunity in providing training for these young people. In our new location, we are excited to announce the CST Global Innovation and Training Academy. The goal of this institution will be to train young scientists in protocols and technologies to meet the technical demands of the industry. We have recognized the need for scientists to embrace a spirit of entrepreneurship. There is huge gap within China in transforming innovation into a marketable drug that can benefit mankind. The Academy will train not only scientists, but also future business leaders that can help to better establish this linkage. ■



Dr. John Gong

52
CEO
3D MED

3D Med is a leading precision medicine company in China focused on advancing science to save cancer patient's lives.

3D Med was founded in 2010 and today is a leader in precision care. Can you briefly introduce the company's background and its mission?

We began with a very small staff that was initially supporting research before gradually expanding into diagnosis and drug development. All of these are linked by a mission to contribute to the fight against cancer, which has become increasingly prevalent in China. Every year there are over 4-5 million new cancer patients in the country. The difference between cancer and most other diseases is the link to genomic information, which must be better understood as a condition for a proper diagnosis, and without proper diagnosis, a good treatment cannot be administered, which formulates the guiding principles for 3D Med. Fortunately, our company direction aligns with the national strategy through the promotion of the biopharmaceutical industry as well as precision medicine. VC funds were therefore very interested in our company, which enabled our rapid growth. We now have over 400 people and six drugs in the clinical stage. This year, we also received funding from the largest government fund available.

How has the attitude towards approaches in precision medicine evolved since the company's inception?

In 2015, former President Obama addressed congress to announce an initiative to emphasize precision medicine. China reacted very quickly, announcing just four months later the Chinese version. However, the investment in the US was only \$5 billion, whereas in China the government dedicated around double that amount. Since then, precision medicine has been very popular in China and many companies in this area have received government funding. There are significant VC funds available in China as well, and we really started to grow during this time. Our diagnosis business began officially in 2015, but our accumulation of knowledge and experience allowed us to present an excellent case to VC funds and begin our operation ahead of most.

3D Med is among the top three in China for patient diagnosis. Can you elaborate on how data plays an important role in helping the company achieve this distinction?

The 3D concept stems from the idea that you need to start with a diagnosis, which generates data. The data will guide you to do drug development, and that is the logic underlying our business model. Patient and genomic data are huge and take up a lot of space, but with proper analysis that information can be useful for diagnosis and determining which medicines are best suited for treating a patient.

Can you provide us with an update on the status of 3D Med's asset under development in collaboration with Alphamab?

Two areas of antibody research, PD- and PD-L1, have confirmed benefit for the patient, as well as CAR-T. CAR-T is a personalized treatment that works for some tumors, but it is very expensive per person per treatment. Our work with Alphamab is a PD-L1 antibody. In the US, five PD1 and PD-L1 antibodies have been approved by the FDA and are on the market, and in China there are more than 10 in the clinical stage. We are the only Chinese company to do global clinical trials with an arm in Japan, and if there are no surprises, our drug will be finished with Phase 1 trials and moving into Phase 2 and 3 very soon. Initial data suggest that it is a very safe compound, boasts a strong PK profile and preliminary efficacy data is highly positive. We will scale up clinical trials in China, US, and Japan off of this success, and it looks like we will bring the compound to market in two years at which point we will also look at listing an IPO.

How is your compound different from others like it under development at present?

For all other approved PD1 and PD-L1 and those currently in clinical development, everything is injected in veins or as an IV fusion. What we developed is a kind of PD-L1 by subcutaneous administration, which is the only one of its kind in the world so far. ■

Mark Engel

CEO
PHAGELUX

Phagelux is highly focused on developing a pipeline around antibacterial products with the goal of becoming a global leader in anti-infectives. Can you elaborate on the reasons underpinning this focus?

Globally, antibiotic resistance represents a huge problem. In some countries, particularly those heavily focused in agriculture, malpractices have worsened human health. Specifically India and China are the two most problematic markets. The urgent need to contain infection drove the founding of Phagelux, which is focusing on biological solutions to bacterial issues. When it comes to drug development, biology is much easier to make narrow spectrum, relatively safer, and easier to understand in terms of the likelihood of success in comparison to chemical solutions. When navigating the clinical stages of drug development, the safety profile of biological solutions is also a huge asset. After accumulating enough resources for several antibiotic resistance focused products, we launched the company.

Why is antibiotic resistance such an important area of disease research?

Compared to cancer, for example, biopharma research on antibiotic resistance is not a hot area. However, a WHO report last year on antibiotic resistance announced that by 2050, more people will die of infection than cancer. Despite this revelation, there has been relatively little translation into new research or funding for antibiotic resistance.

What has been your experience navigating the capital markets, and how do you expect the investment climate to evolve as Hong Kong considers adapting its list-

ing requirements in favor of biotechs?
Phagelux utilizes phages, lysins and other biologics and related delivery technologies to create antibacterial products and solutions.

Currently, most funds in China have difficulty to invest overseas because it goes against the current government policy, and at the same time, China lacks a public market for biotech companies. A Chinese-based company presumably wants to secure local financing, but it presents a challenge if local financing cannot provide a structure for listing overseas where the current markets are located.

Ultimately if you have a positive program you will find investment. However, there is a global misconception regarding the amount of quality capital available. Phagelux likes sophisticated investors that understand the biotech industry.

How is Phagelux's approach to biological research contributing to the innovation wave in the China biopharmaceuticals industry?

Little of what we are doing is innovative in the sense that phages have been used in Eastern Europe for a long time. On the other hand, what we are doing that is tremendously innovative in regards to using phages is to create preventative products. Phages have historically been used to treat, but we have been able to create sustained release solutions that allows us to prevent infection in the first place. Given the high cost of treating infection, our products will save healthcare systems a lot of money since we will reduce the number of patients that get an infection. More specifically, there will be significant cost savings if we can prevent infections due to antibiotic resistance strains of bacteria.

Although we are focused on antibacterial



resistance, we have not targeted some of the more problematic areas. Rather we have focused on topical treatments. We have done so since topicals typically have less regulatory hurdles. Once regulators can accept the usage of phages, we believe there are a lot more interesting things we can accomplish. We are now working with both phages and the lysins, which are the enzymes produced by phages that break down bacterial walls. For some types of infections, such as acne, where the consumer plays a greater role, we believe that lysins are more marketable.

What factors have contributed to making the present an interesting time to invest in China's bio-pharmaceutical industry?

Generally speaking, you can find new science anywhere, but what is special in China is the enormous resource of talented scientists, concentrated patient pools, and an increasing number of highly capable pharma leaders. Scientists here are incredibly talented, and they are becoming better educated, not just in science, but in the business of science. This group of people is the right age, has often been educated overseas, and has the right experiences to understand organizationally how to build a company. The government has also been heavily supportive of infrastructure that fosters an ecosystem not just to improve upon existing innovations, but to introduce novel ideas. Ultimately, how many people you help is the best measurement of innovation. But, at least in the short-term, the number of highly qualified scientists in China will be the primary driver of new innovation. ■



Dr. Jijun
Yuan

54

VP
GENECHEM

Genechem offers research and development services for life science solutions to support gene research.

Genechem was founded in 2001 and has been collaborating with physicians to meet their re-search needs as a CRO. Can you highlight the company's key focus today?

Our focus area is oncology and through our work with doctors we endeavor to discover whether there are any technologies or novel drug targets that can be identified through the combined ex-pertise of medical biology, cell biology, and immunology experts working together. When I joined Genechem two years ago, we decided to invest more intensely in our own drug discovery activi-ties. Our technology is based on anti-virus cells, and the company is focused on cell and gene therapy, as well as therapeutic antibodies. This company's ultimate goal is drug discovery, but the CRO will continue to work with doctors.

How does Genechem's strong relationship with doctors influence its research efforts?

Doctors can tell us where within the medical field there are problems that need to be better ad-dressed. We use our technology and knowledge combined with their experience to develop novel methods of meeting these needs. In pursuing that objective, they are often involved in the very early stages of research, but do not have the money or energy to develop their ideas in full. Through our relationship with doctors, they can out-license or collaborate with us to develop and push the project to a product.

Can you provide some more insight into Genechem's project pipeline?

Our key project is a first-in-class target that a doctor has been working on for 10 years. Based on the clinical trials we know the antibody is very specific for gastric cancer. Genechem has spent one and a half years specifically determining the target, including antibody humanization and the development work. We presented the data last year at AACR, and have since demonstrated that the efficacy and safety data are very strong. We are seeking conversations with global pharma-ceutical companies to ascertain whether their is potential for collaboration. Our company has the capabilities to conduct the R&D and phases one and two, but we require more resources to ad-vance further.

What trends have you observed in terms of the focus of research efforts in China?

Many biotechs are mostly involved in cancer. Because of the competition, many people are in-creasingly focusing on COPD, virus or infectious disease. Nonetheless, oncology remains the most crowded with most players working in the small molecule or antibody space. Our angle is cell and gene therapy, which is not an area many in China have attempted, so we are trying to use CAR T-cell therapy as our differentiating angle.

What is the advantage for Genechem in taking this approach?

Our work is high risk, but if we find something, there is potential for larger impact. China has a lot of patients and samples that if used correctly, can be leveraged for greater developments within the industry. Cell therapy is still very early stage, just like antibodies were 10-15 years ago. In Chi-na, cell therapy represents an opportunity for the players here to perform at the same level as global pharmaceutical players. Looking at clinical trials, cell therapy trials in China are almost the same as in the U.S., which is certainly not the case in small molecules, for example. CAR T therapy is heavily based on the target, and because we have strong relationship with doctors and there-fore good access to samples, we can screen to find novel targets which is a great advantage for Genechem.

What is your outlook on the future of the pharmaceuticals industry in China?

In the past, there was a lot of emphasis on the "me too" model in the project pipelines. Now many have best or first in class projects. There is a new sentiment felt among the Chinese phar-maceutical community that if you want to survive, you must innovate. Many companies are look-ing to list on NASDAQ or Hong Kong, which is a further testament to the high level of innovation we are seeing in China. We believe this is only the beginning of the innovation period, but based on the progress in the past 5-10 years, we will become a powerhouse in the global industry be-cause we have the patients, samples, and support from national funding that will allow us to compete. ■



Dr. Chengbin Wu

CEO

EPIMAB BIOTHERAPEUTICS

Epimab is a start-up biotech company based in Shanghai China that specializes in bi-specific antibody technology and bi-specific format technology.

EpimAb is a privately owned company established in 2015. Can you briefly introduce the company's core focus?

EpimAb is an innovation driven biotech company based on propriety technology called Fabs-In-Tandem (FIT-Ig), which is a new generation bi-specific antibody technology. Based on the technology, we are taking a platform approach in which we collaborate extensively with companies in China and also in the US and Europe. We partner on technology and early projects, and we are also focused on internal product development with a focus on oncology.

Our pipeline has expanded into several important areas; one is a second generation target therapy which we still believe holds tremendous opportunity. The second area is looking at the next generation of molecules in immuno-oncology that addresses patient response and resistance mechanisms. The third area is T cell engager mechanism, which is an idea similar to CAR-T, but using a bi-specific approach as well as the new generation of CD3 and NK-based engagement mechanisms.

How have you been funding the company's activities so far?

We completed our series A funding for US\$25 million last year and just kicked off our B round financing where we are looking to raise an additional US\$50 million to support our program into phase II. In terms of important milestones, funding is definitely one of them and for the internal program we will file IND this year in mid-July in China and in August in the US. Listing in Hong Kong is an interesting opportunity, and it seems like there are a lot of advantages going to an IPO for a company like ours in Hong Kong, but our initial plan was to do an IPO on the NASDAQ.

Can you elaborate more on your FIT-Ig technology and what benefits it offers?

Although there have been several technologies already developed in this space, there are still issues with drug-like properties and also manufacturing efficiency. Some technologies have biology issues because you are putting two binding domains together in certain ways, resulting in steric hindrance issues. These types of technical issues exist for most bi-specific

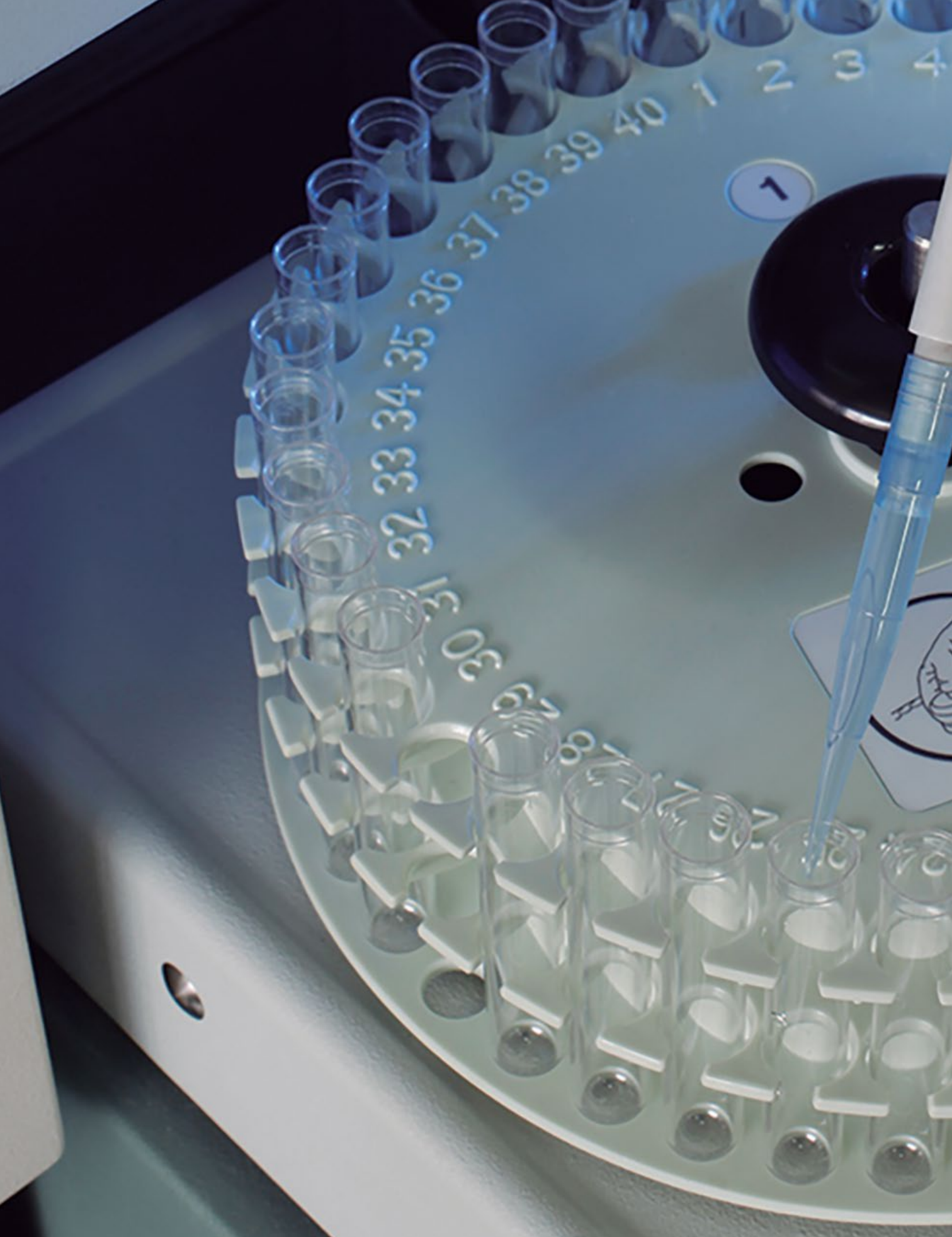
technologies, so we are trying to develop a more generally applicable technology. We basically combine the two FABs in a criss-cross orientation in order to avoid the heavy and light chain mispairing problems and at the same time you are able to retain the full structural integrity of both FABs, therefore maintaining the structural stability of the whole molecule. This allows for the production of a more stable therapeutic molecule.

Where are you seeing the most potential and interest to license this technology?

One is Chinese pharmaceutical companies looking for new opportunities in drug development. In the past 10-15 years most of these companies have been focused on biosimilars and they have realized to compete in this market they will need to introduce innovative programs. One example is Innovent, which has several programs in phase II and III. This is a company that has robust research and development capabilities, and we had a technology license deal with them. The other area of collaboration is in the global biotech space because a lot of companies are doing research and development programs on new targets. Combining two antibodies into a bi-specific is an interesting approach that can provide some differentiation.

What is the vision for EpimAb going forward?

The key for a start-up to be successful in the current climate in China is to identify a strong differentiation strategy. In this regard, our bi-specific platform has given us leverage. The key for bi-specific development is to identify a synergistic mechanism that can be only achieved by a bi-specific molecule, which will provide a strong differentiation with antibody therapies or a combination of two antibodies. This is the key aspect that we wish to achieve through our program development. Additionally, we have positioned ourselves as a global company whereby we focus strongly on collaboration and co-development opportunities around the world. In two or three years we will have our first program in phase II and two other anti-cancer programs in phase I in both China and the US. ■





Services: Constructing an Innovation Infrastructure

"China will become an innovation hub as the ecosystem for innovation becomes more robust, again through the support of the government. The pharma service organization will play an important role in creating the infrastructure to enable innovators to innovate more efficiently and meet global standards."

- Oliver Ju,
CEO,
Porton Pharma Solutions

Contract Services: Building an Innovation Infrastructure

58

With key ingredients present including capital, a favorable regulatory framework and talent, the other fundamental necessity for innovative R&D pipelines to see progress is adequate support infrastructure. The country's R&D capabilities cannot be measured solely by the many exciting projects that are proliferating in biotech startups without understanding the contract service landscape. "China's biotechs are fast-growing, however the development of the supporting infrastructure does not match this pace and the research environment needs to be up upgraded. Unsafe and unclean facilities can be damaging to a scientist's health and are not conducive to inspiring innovation," highlighted PC Zhu, CEO of ATLATL, a company looking to incubate start-ups in state-of-the-art facilities in Shanghai.

Globally speaking, contract services have evolved to become increasingly integrated, with benefits including better cost structures and accelerated timelines for drug development. According to Grand View Research, the global Contract Research Organization (CRO) industry is expected to reach US\$45.2 billion by 2022. This trend

is just beginning to pick up speed in China where Chinese CROs like WuXi AppTec, Tigermed, and VenturePharm have begun to challenge leading multinational CRO companies such as Covance, PPD, or Quintiles. Nevertheless, there is still significant opportunity for more localized development. A report published by the National Center for Biotechnology Information (NCBI) asserts that, faced with the pressures of a consolidating industry, Chinese CROs has transformed from a "cost-saving" mindset to a value-added proposition, a model that lends itself to integration.

While many Chinese CROs have capacities across the full drug development value chain, there is a tendency towards specialization. Shanghai-based PharmaLegacy differentiates itself through its strong in-vivo capabilities, for example, while BioDuro, a CRO that started in San Diego, looks to bring cutting-edge technologies to China such as the hTME-3DX Screen and Verify in Shanghai, the world's first drug screening platform to combine humanized 3D cell culture and patient derived xenograft models across a set of 300 proprietary tu-

mor models. Finding a partner that provides the right preclinical or clinical facilities to meet the particularities of a given project is no doubt critical, and potential clients are also looking for companies with strong credibility as China's pharmaceutical sector increasingly looks to engage global markets. "Most CROs we are interviewing are all clinically focused. They are experienced and well positioned in China. Quintiles is a good one, and we have been using them for phase 1, but the focus between trials is slightly different. Phase II/III will have more hospitals and PIs to manage, so we need someone more experienced to carry out a very aggressive clinical strategy. Because we are looking at international markets, we are looking for a CRO that has an international reputation so that the data can be used for our global development," explained Dr. Sui Xiong Cai, CTO of Impact Therapeutics, a biotech that will seek to release human efficacy data for its best in class PAP inhibitor candidate sometime this year.

Debate among contract service providers over the ethics of in-house drug develop-



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**- Gang Wu,
Vice-General Manager,
Anpel Laboratory Technologies**



ment projects running alongside clients' assets is a topic that will continue to invite varying opinions. With China's strengthened IP framework in place, some companies have embarked either on their own drug discovery arms or engage in profit-sharing or joint venture models. Others maintain that they will be able to provide better services by staying true to the core business of a service provider. "Sundia will not engage in these activities, instead remaining committed to the principle of being a pure service provider," said Dr. Jim Li, CEO of Sundia. "We believe this business model will allow us to grow and better serve our clients by avoiding any conflicts of interest."

Much like the CRO sector, contract manufacture organizations (CMOs) and contract development and manufacturing organizations (CDMOs) have been squeezed to adapt, particularly given the crackdown on GMPs as China aligns itself with ICH standards. The CDMO model is an attractive one for companies looking to leverage their existing assets in a more lucrative fashion, but the barriers to entry are higher than



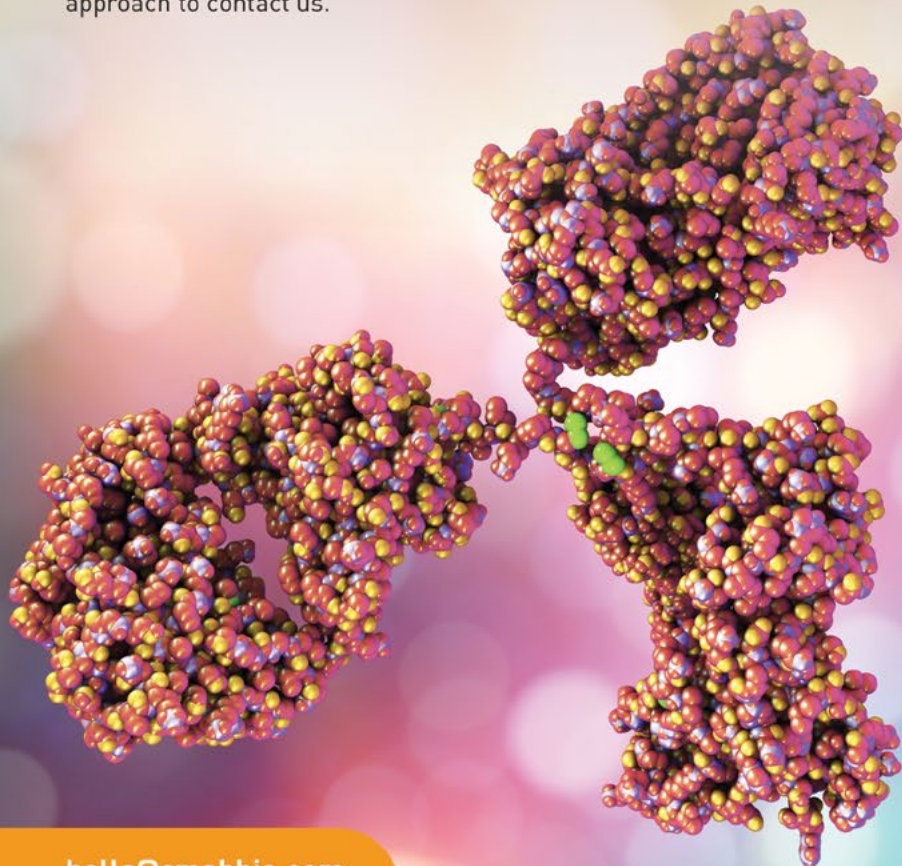
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Image courtesy of Cool Pharm



some may anticipate. “In China we have observed several newcomers entering into the CDMO space, seeing it as more lucrative in comparison to the small margins to be made in generic APIs, but they do not understand the nature of the business,” said Oliver Ju, CEO of Porton. “Many companies see their chemical synthesis capabilities and FDA approved plant as sufficient to evolve into the industry. We do not see these newcomers as a threat, because CDMO is a very different service model that these players will need time to understand how to effectively implement the differences.”

End-to-end services are highly sought after as a more efficient and accelerated means of getting a drug to market. As China’s fragmented industry consolidates, M&As and partnerships between companies with complementary service offerings present viable pathways towards integration. Porton, founded in 2005, is actively seeking to expand its service offering in this manner. The company has a partnership with BioDuro and recently announced a global

partnership with Codexis for biocatalysis. “Innovation heavily influenced our strategic direction, which will be very different going forward. The first phase was about being one of the best API CDMO companies, but our vision now is to become a pharma service organization that offers end-to-end solutions both in large and small molecules,” said Ju. “We will not only be a CDMO company, but provide solutions from discovery to development to manufacturing — a vision that is reflected in our name change to Porton Pharma Solutions.” Improvements in manufacturing practices not only apply to drugs, but the products that surround the pharmaceutical value chain, which will continue to elevate the standards of the entire industry. “The overall increase in quality is coming from a widespread trend of individual companies changing their attitudes, as well as their sourcing and manufacturing policies,” said Gang Wu, vice general manager of Anpel Laboratory Technologies, a leading developer, manufacturer and distributor

of laboratory equipment. “It is a common misconception that Chinese companies are concerned with keeping costs low at the expense of creating high-quality and durable products. While we are always striving to keep production costs low, we have strict supply chain quality control management procedures in place.”

As the quality of the services sector improves and contractors increasingly align with the global trend towards integrated drug development value chains, China’s R&D capabilities are shaping up. The important next step will be developing its capacity to meet increased demand for biopharmaceuticals, which we explore in the next section through the journey of several companies that are rising to the challenge.

Building a Capacity for Biopharmaceuticals

While many leading contract service providers from research to manufacturing have

traditionally seen their client base coming largely from international companies, there is growing opportunity in the domestic sector as Chinese companies become increasingly challenged to innovate and partake in drug discovery programs. The specific pivot towards biopharmaceuticals and the potential business opportunity in China's burgeoning biotech space is not lost on companies attuned to market trends. "Our services are typically offered to medium to large companies, however, with the growing number of biotech startups, we anticipate servicing these companies as well as their pipelines advance beyond the early growth stage," said Zhang Tianyi, general manager of Frontage Laboratories China, which has a three-prongs service offering including bioanalytical, clinical and CMC services. "In anticipation of this growth, Frontage has been investing, building capabilities in areas like cell based labs, large molecule service groups, antibody drugs, and protein studies. Newer drug developments are concentrated in the large molecule, biological side as compared to small molecule based drugs."

In China, a deficiency in qualified drug development contractors created a business opportunity seen by many, including CMAB, now the fastest growing CDMO globally according to the company. "We established a new CDMO company in China because our investors had wanted to develop a new drug, and there were not any CDMOs suited their needs, except one, which did not have the capacity to take on new projects," confirmed Qibin Liang, president and founder of the company.

CMAB looks to integrate the most cutting edge technology into its service platform, which currently boasts its own cell line technology, scale up/scale down technology, and state of art quality systems. The company is actively looking to engage with other technologies to further advance their services: "Our strategy is to acquire cutting edge technologies from around the world and introduce them to China, particularly those from Europe, the US, Japan, and

Australia. For example, one company we are speaking to uses a robot to do cell line development, and we believe eventually we will integrate AI to improve the quality of our services. We aim to be the most advanced and technologically savvy CDMO in the world," added Liang.

Because China has long favored mass production at small margins over quality and innovation, the CDMO sector largely does not have the capacity to support innovative companies working with complex technologies in the biological field. Gloria Huang, CEO of fully integrated drug development company TOT Biopharm, explained: "Worldwide, of the top 10 products in terms of sales, eight are biologics. Biologics have a high technological barrier, but current trends suggest that they will soon surpass small molecules in terms of market share. As an oncology-focused company, if we do

not have biologic capabilities we will fall behind our competitors. In 2011, we began to focus heavily on biologics and, since then, we have managed to achieve much to support our capabilities in this therapeutic segment."

TOT Biopharma offers three core technology platforms, including monoclonal antibody, oncolytic virus, and speciality liposomal drugs, and continues to upgrade and expand its manufacturing capabilities, including opening its stage two facilities in May 2018. Despite many players in China's manufacturing space, Huang elaborated on why these platforms are such a differentiating factor for the company, which further distinguishes itself through its experience working in ICH compliant pharmaceutical industries. "Focusing on unmet medical needs, tapping into large markets, and emphasizing an innovative pipeline are funda-



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Traditionally, pharmaceutical companies in China focus on small-molecule generic drugs. For Frontage, 80% of the market is for servicing small molecule drugs versus 20% of large molecule drugs, but we are anticipating the shift as China is pushing more efforts toward new drug development, and we are building and investing accordingly.

- Zhang Tianyi,
General Manager,
Frontage
Laboratories
China



mental to our strategy, but the technological barrier to ADC also represents a key opportunity for TOT BIOPHARM,” she said. “The technological barrier is so high in China, and while there are increasing numbers of manufacturers on the competitive landscape, less than 10 have the capabilities we offer, which includes the OEL-5 isolator for ADC.”

As companies adapt to the biopharmaceutical market, there will also be niches available for highly specialized areas like immune-oncology and other therapeutic treatment paths that require technical support. “In the past two years, there has been a revolution in immuno-oncology, where we have seen some of the hottest research projects that we aim to support. In this area, large molecule, small molecule, and CAR-T targets have seen important developments,” observed TJ Deng, general manager for BioDuro China. “BioDuro determines where there is a need to service these hot areas in terms of people and technology. For example in support of immuno-oncology research, we built up our CAR-T service platforms beginning in 2016, and we are

optimizing and improving our antibody discovery platforms,” he said.

As R&D support capabilities continue to develop in China, cities like Suzhou, that offer a more attractive quality of life for scientists working in the services sector, will become more important, while Shanghai will undoubtedly remain a crucial point of reference for capital and to attract top-level talent. The emergence of a strong innovation ecosystem will benefit significantly as the culture and attitude of excellence is embraced within these emerging innovation hubs. As ATLATL founder, PC Zhu, highlighted: “Shanghai is a center of excellence for fashion, global trade, investment, art, and entertainment. We want to build a campus that embeds these values,” he said, adding: “Science and art are not separate, and culture is the balance between the two. Our location is not just a research place, it seeks to offer a culture and lifestyle that encourages creativity. Facebook and Google offer workspaces for employees that are geared towards inspiring the exchange of ideas, and likewise, scientists each contribute pieces of innovation to one another.” ■



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Oliver
Ju

CEO

PORTON PHARMA SOLUTIONS

Porton Pharma Solutions is a top-tier, China-based external manufacturing partner and strategic supplier of custom drug intermediates and APIs to many of the world's leading companies.

■ **Porton recently launched the new name Porton Pharma Solutions. Can you briefly introduce the company and how it positions itself in China and globally?**

In our first decade, we were heavily focused in the small molecule space, working mainly for the big pharma companies. We have done well, building the organization to become a leading global CMO in intermediates and APIs. We are very proud to differentiate ourselves by our strong service focus and customer-centric approach. Last summer we reviewed our first 10 years and our last three years as a public company in China, and we shaped our new strategy for the next 5-10 years.

■ **What trends have most significantly impacted Porton's strategy for its next decade?**

Innovation heavily influenced our strategic direction, which will be very different going forward. The first phase was about being one of the best API CDMO companies, but our vision now is to become a pharma service organization that offers end-to-end solutions both in large and small molecules. We will not only be a CDMO company, but provide solutions from discovery to development to manufacturing — a vision that is reflected in our name change to Porton Pharma Solutions. It is time for us to expand into the relatively new areas of biologics because we see the market is looking for end-to-end services that create the best value for customers through accelerated drug development processes.

■ **How are you investing in your capacity to service a customer base in the biopharmaceuticals space?**

We are very close to complete a raising to finance our future growth in the biologics space, but we have not made that investment yet. We hired an experienced management team that has helped us to build a strategy to enter the global biologics space. We may take a greenfields approach whereby we are looking to build facilities, likely in the US, from early development services into clinical manufacturing services. We are also looking at global acquisition possibilities in the biologics area, mainly in Europe, China and the US. Furthermore, we are open to forming more strategic collaborations like our partnerships with BioDuro. We are two separate organizations, but we trust each other and offer complementary

service capabilities that can be joined together to offer better service and value to our same customers. Our partnership is a good case study on how to simplify and streamline the program management process across two organizations. As a public company, we will seek to leverage our position to conduct M&As that bolster the solutions we can offer customers, and we will also look for opportunities to work with technology companies in this regard, for instance, the just announced global partnership with Codexis for biocatalysis.

■ **How have you seen the competitive environment in the CDMO sector change in China?**

While this landscape is more settled in the West, there is still much competition in the Asian markets. In China we have observed several newcomers entering into the CDMO space, seeing it as more lucrative in comparison to the small margins to be made in generic APIs, but they do not understand the nature of the business. Many companies see their chemical synthesis capabilities and FDA approved plant as sufficient to evolve into the industry. We do not see these newcomers as a threat, because CDMO is a very different service model that these players will need time to understand how to effectively implement the differences.

■ **Going forward, what factors support your commitment to investing in Porton's capabilities in China?**

China will play a greater role in the next decade in two ways. One is market size. China is the second largest drug market, but given the population and the country's current phase of economic development, we have reached a point where healthcare spending will be increasing, making the market more and more important. The transformation on the regulation side favors innovation, and the unique social system here allows for much quicker implementation than in other places. Secondly, China will become an innovation hub as the ecosystem for innovation becomes more robust, again through the support of the government. The pharma service organization will play an important role in creating the infrastructure to enable innovators to innovate more efficiently and meet global standards. Porton adheres to these global standards and is well-positioned to help our clients access these opportunities. ■



Qibin Liang

64 President & Founder
CMAB

CMAB was founded to provide international-standard development and manufacturing services for biologic products, with an initial focus on pre-clinical and early-stage clinical (Phase I/II) products for customers in China and across the globe.

Can you briefly introduce CMAB and highlight the opportunity in the China market that led to the company's creation?

We established a new CDMO (Contract Development and Manufacturing Organization) company in China because our investors had wanted to develop a new drug, and there were no CDMOs that suited their needs. Several companies invested a total of \$38 million in our Series A financing to launch this company and, in April 2018, our series B round raised another \$34 million to help accelerate and expand our capacity. We are now aiming to conduct an IPO by 2021. We are the fastest growing CDMO company in both China and the world. From the time of our registration in June 2017 until March 2018, we grew to employ 108 people with as much as 30 years of experience in the biologics industry. We already have three contracts, and we expect this year to sign additional contracts valued over 150 million RMB in total.

What are the key considerations for building a successful CDMO right now in China?

The most critical component is the team. Most failures in this sector result because of an inability to organize a strong group of people. Each member of the team must be at the top of their specific field, whether it be cellular development, GMP manufacturing, IND submission, and so on. We spent almost a year and invested heavily to bring the most qualified leadership to CMAB.

CMAB aims to offer the largest CDMO facilities worldwide by 2021. What factors contributed to your decision to set up in Suzhou?

Shanghai was our initial choice, but it was very difficult to find a central location and living expenses are unattractive for the talent pool we wanted to get on board. Suzhou was the ideal solution because it balances all of our needs. It is challenging to find qualified people in China, but Suzhou boasts affordable living costs and is a highly developed scientific and technological district containing a cluster of talents. The local government has more willingness to provide support (e.g. preferential policies for land usage, office facilities rental etc.), particularly given that CMAB's vision aligns with the government's focus on improving biological manufacturing capabilities in China.

What is your current client profile and where would you like to see CMAB expand?

In our first stage, we are looking to support small/medium local companies that have a drug DNA sequence but do not have their own facilities. We can develop that sequence all the way from the R&D phase into the clinical phases 1, 2, and 3. Of the three companies that have signed contracts with us, one is from the US, and our next strategy will be to expand further into the US and European markets. In three to four years we would like to be working with a big pharma company, which is why our management team includes several internationally based members. International clients will strongly benefit from the fact that we offer 'China for China.' Most companies want to take advantage of the China market, and we provide that proximity.

How do you see AI playing a role in enhancing the quality of service that a CDMO can offer?

Especially in the early stages, we believe AI can provide us with an advantage over our competitors, particularly in helping us achieve a high quality standard in GMP procedures for all of our clients. We invested over 20 million RMB in our software to ensure data integrity. No CDMO in China has invested so heavily in this technology, mostly because people are not aware of how critical this issue is. A fundamental goal of CMAB is to contribute to improve Chinese companies' IP protection. Unfortunately, China does not have a good reputation in this regard, but we are committed to changing that conception.

Can you share the vision you have for CMAB going forward?

We plan to become one of the top two leading CDMO companies in China within two years by working with large pharma companies and expanding our scope to attract more international business. CMAB aims to provide the most advanced technologies and highest quality services, and we are strongly committed to protecting our clients' IP interests. We are a pure CDMO and do not offer our own products. Our investors were very firm from the onset that CMAB remain purely a service provider to avoid any conflicts of interest. ■



Gloria Huang

CEO
TOT BIOPHARM

TOT Biopharm is a fast-growing biopharmaceutical company that develops, manufactures, and markets anti-tumor drugs.

TOT BIOPHARM is an oncology-focused biopharmaceutical company founded in 2010. Can you provide a brief company history and elaborate on the company's cancer-fighting mission?

TOT BIOPHARM is a fully integrated drug development company that specializes in developing, manufacturing, and marketing drugs in the oncological field. Our R&D team and manufacturing assets are based in our stage one facility in Suzhou Industrial Park. These facilities were completed in 2012, and include the first BSL-2 certified viral facility verified by the Jiangsu provincial government. We will expand into our stage two facilities by May 2018. Our approach to fighting cancer involves utilizing a combination of treatments, and this means we also firmly

believe in the power of supportive care that goes beyond physical to include spiritual health.

Currently TOT BIOPHARM's only commercial product on the market is S-1. Can you elaborate on its capabilities and the rest of the company's oncology-oriented pipeline?

We in licensed S-1 from a Japanese company called Taiho Pharmaceutical, and we are in charge of marketing in 22 different provinces within China. This product is focused on treating gastric cancer, but has shown indications of treating pancreatic cancer. Concerning our in-house developed products, we have submitted 7 IND applications to the CFDA including four mAbs and three small molecules, six of which have received IND approvals from the CFDA.

Can you provide further insight into TOT BIOPHARM's three core technology platforms?

The Monoclonal Antibody is our key platform, which encompasses Antibodies (including biosimilars, new formulations/indications, and new biologics), and Antibody Drug-Conjugates (ADCs). In April 2018, we announced that our first ADC product had been cleared by the CFDA to enter the next stage of clinical trials. Our next generation Oncolytic Virus is another very innovative platform held by TOT BIOPHARM, which in comparison to the first generation of oncolytic virus accomplishes dual-insertion of immune modulators. Against cancer, the immunity can be more enhanced, providing us with a powerful tool to leverage in the fight against cancer. We also offer a small molecule platform that leverages Specialty Liposomal Drugs.

How does TOT BIOPHARM differentiate itself from other domestic manufacturers and how are you strategizing to stay ahead in the continuously evolving oncology field?

Worldwide, of the top 10 products in terms of sales, eight are biologics. Biologics have a high technological barrier, but current trends suggest that they will soon surpass small molecules in terms of market share. As an oncology-focused company,

if we do not have biologic capabilities we will fall behind our competitors. In 2011 we began to focus heavily on biologics and since then we have managed to achieve much to support our capabilities in this therapeutic segment.

The China Government has introduced many new regulations in support of innovation. Can you highlight a policy that has had particular impact on TOT BIOPHARM?

Last year, the government published policy MAH (Marketing Authorization Holder). Previously, the China government favored locally-made products and the drug license was only issued to companies with the manufacturing capabilities, not to the sponsor, which meant that to access the China market companies had to out-license their product to a manufacturer based in-country. This policy has been changed to include a market authorization holder. This allows sponsors to find a local domestic manufacturer to do the CDMO work while still holding the drug license. The policy encourages small, innovative research companies to collaborate with organizations like ours to accelerate the development of their products.

Looking towards the future, what is TOT BIOPHARM's key objective and where are their opportunities for the company to expand?

From May 2018, the China government will cancel all import tax on cancer drugs, which is fantastic news for patients and hospitals in terms of gaining access to more and better quality drugs to fight cancer. TOT BIOPHARM sees this as an opportunity to continue focusing on increasing our global collaboration activities because we endeavor to introduce more good candidates to the China market through co-development of drugs. In this vein, we are looking for more novel technology platforms and pipelines to continue in our mission to bridge combination treatments through a multi-platform approach. This year TOT BIOPHARM is also preparing to have FDA pre-IND consultation and we will have our first submission to the US FDA. Ultimately, our vision is to provide patients' with good quality, reasonable price and affordable treatment. ■



TJ
Deng

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GM
BIODURO CHINA

BioDuro is a global provider of contract research, development and manufacturing outsourcing solutions.

BioDuro first commenced operations in Shanghai in 2012 and recently completed an expansion of this office in 2016. Can you briefly introduce the company's key milestones and the strategy behind expanding into China?

BioDuro began in San Diego in 2005, and our first international expansion was in China. This expansion was motivated by the pool of talent and resources that we saw in Beijing. Since inception, our approach in China has been different from other CROs. While we offer full-range services including chemistry, antibody services, animal studies, DMPK, and pharmacology, BioDuro began under the concept of integrated discovery. Under this mandate, the company has grown exponentially and, in 2009, the American company PPD acquired BioDuro to extend in the drug discovery space in China, which paved the way for our expansion into Shanghai in 2012. In 2015, our founding company Bridgewest Group acquired us back from PPD and after that we have merged with Formex, a manufacturing pharmaceutical company specializing in formulations to expand our manufacturing capabilities. In 2016, we launched hTME-3DX Screen and Verify in Shanghai, the world's first drug screening platform to combine humanized 3D cell culture and patient derived xenograft models across a set of 300 proprietary tumor models. And we recently acquired Molecular Response, a U.S. translational oncology research platform with a massive bio bank of viable tumor samples to provide to biotech and pharma.

How have CROs in China been impacted by the new emphasis placed on innovation and how are you adapting your service offering to align accordingly?

China was traditionally only focused on generic drug development, but the introduction of new regulatory policies geared towards fostering innovation have led to a wave of innovation. Initially our business from Chinese pharmaceuticals accounted for less than 5%, but it has grown to as much as 10-15%. We have seen growth in demand for specific services that are further evidence of the innovation trend. In China, CROs play an increasingly important role to support innovation in drug discovery. BioDuro differentiates itself in this space by acquiring and licensing new technology platforms from the U.S. and bringing them to China to provide accessible services lo-

cally. Knowledge and emerging technologies transference from the leading markets plays a key role in developing our local markets. In San Diego for example, our facility specializes in compound solubility enhancements. These novel formulations assist in bioavailability and we are moving this technology into China to provide this service to Chinese companies. In addition, the hTME-3DX Screen and Verify platform we launched in Shanghai was also introduced from the US and exclusively licensed by its developer Molecular Response. The technology retains the structure of a tumor and offers the diversity and biological relevance of clinically meaningful models through samples of various tumor types derived from human patients and maintains throughput capability and results in greater cost and time efficiencies in drug screening.

In which areas of the drug discovery space areas have you seen the most activity and how is BioDuro responding to changes in demand?

Oncology has been the emphasis for a while now, largely because of the substantial funding opportunities and it is easier to navigate in terms of regulatory approval. In the past two years there has been a revolution in immuno-oncology, where we have seen some of the hottest research projects that we aim to support. In this area, large molecule, small molecule, and CAR-T targets have seen important developments.

Going forward, what vision does BioDuro has for itself and what is your outlook for the development of the CRO sector in China as the pharmaceuticals industry continues to emerge as a global leader?

This is a great moment for the CRO sector, which is experiencing strong growth not just from big pharma but of the successes in the biotech space as well. Our issue now is not the amount of the business, but where we can source enough quality people to meet the demand from our clients. In terms of size, BioDuro is among the second tier of CROs but we have very comprehensive services from drug discovery to CDMO, and from small molecule, large molecule, and T-cell. We are a US company and we maintain high standards so that our clients feel comfortable working with us. We strive to accomplish quality-driven growth that emphasizes technology in support of our integrated drug discovery model. ■



Dr. Jim
Li

CEO
SUNDIA

Founded in 2004, Sundia is a leading pre-clinical contract research organization (CRO) providing a comprehensive and integrated portfolio of high-quality drug discovery and development services.

Can you briefly introduce Sundia and highlight the opportunities you saw in China that led to its creation?

People such as myself that were educated abroad and have gathered experience running western pharmaceutical companies in the US were able to bring this experience to China to help develop strong business operations. This model has been very successful, and Sundia as an example has grown to employ 800 people and boasts more than 200 clients worldwide, including most of the major players in the big pharmaceutical sector. The drug discovery process requires a combination of many scientific disciplines from biology to chemistry that must combine with medical research to understand disease and mechanisms to cure that problem. We contribute to the pre-clinical area, and we supply APIs to the clinical trial companies.

What advantages does a CRO offer that have led to overall growth in the sector?

In 2004, most big pharmaceutical companies would do their own R&D. However, today very few pharmaceutical companies house large research teams due to a shift towards utilizing CROs, and there are several reasons this trend will persist. The cost of drug research has skyrocketed, and these companies need to find resources that are more cost-effective. CROs are more efficient, especially compared to small and medium sized pharmaceutical companies, which may be prohibited by large investments needed in expensive equipment or technology platform that may only be used for one stage of the research process. Operational flexibility is also an advantage that CROs can offer. When molecules become late stage, smaller companies may need to lay off chemists or technicians, but a CRO like Sundia offers this operational flexibility.

What do you see as the key advantages of conducting drug discovery in China over destinations like India or the US?

Firstly, the protectionist regulatory policies regarding marketing a drug in China compels the manufacturing of the drug to take place in China because the cost of importation is extremely high. Secondly, supportive infrastructure and strong supply chain development aid China in gaining the advantage over India. Our effective import-export system experiences less customs delay and boasts relatively quicker turnaround time. The US has more advanced, highly

trained manpower, particularly in early drug exploration focusing on biology and medical research. However, when talking about chemistry synthesis, the labor force in China provides an advantage because at this technical level there is not much difference in terms of skill but China offers a cost benefit.

Where does Sundia see the most geographic potential to expand its client base?

At the moment, Sundia derives 75% of its business from companies coming from all around the globe, while the rest are domestic clients. Several factors have been driving growth in our domestic customer base as Chinese companies increasingly enter the drug discovery space. These companies are motivated by competition because it is a highly fragmented market of around 6000 Chinese pharmaceutical companies competing in the field of generic drugs. In late 2015, China launched a new qualification process for generics that requires comparative clinical trials with an original drug to determine whether performance can be matched. These trials cost 12-15 million RMB per product at great risk of failure. Given the severe competition for generic drugs, this proved lethal for some companies as these drugs come with slim margins leading to the mass exit of 900 companies by late 2016 and the trend is continuing. In combination with resources and incentives provided by central and local government, this has driven Chinese pharmaceuticals companies to search for new drugs, which provide higher margins and patent protection, however they largely do not have experience in drug discovery which is where CROs like Sundia can play an important role.

Looking ahead, what are your outlook for the CRO sector in China and your vision for Sundia?

We are confident that Sundia's team offers the know-how and technology to support our customer's needs. China has good infrastructure to support our growing business. Many CROs have begun their own drug discovery projects through various collaborations such as profit sharing or joint ventures. Sundia will not engage in these activities, instead remaining committed to the principle of being a pure service provider. We believe this business model will allow us to grow and better serve our clients by avoiding any conflicts of interest. ■





Conclusion: Embracing Disruptive Technologies

"Pharmaceutical R&D is still very labor-intensive, and automation has not been successfully applied to these processes. In this very special and historic period in technological progress, we predict that pharmaceutical R&D will actually skip automation and advance directly to intelligent R&D."

- Dr. Xing Li,
CEO and Founder,
Deep Intelligent Pharma



Conclusion: Embracing Disruptive Technologies

70

2018 represents the 40th anniversary of the China's reform and opening up policy and, since that time, many of the nation's industries have experienced extraordinary growth as the government steadily moves to consolidate its position as a global leader socially, politically, and economically. The life sciences industry is no exception, and indeed plays an integral role in elevating China from a manufacturing based economy to a more sophisticated, services-oriented market. However, the blue ocean tech space is the opportunity where China knows it really has an opportunity to assert itself as a world leader, evidenced by a race with the US to develop AI technologies. The clashes between the two nations as they hurtle towards a trade war over accusations of IP infringements suggest that the US is indeed listening to the prediction issued by

Eric Schmidt, former chairman of Google's parent company, that China's AI capacity will overtake the US's by 2025.

In the pharmaceutical industry, there is a global issue in better utilizing data for optimized performance across the entire drug development chain from discovery to sales. "The application of any technology to the pharmaceuticals industry is still generally at a very rudimentary stage," confirmed James Irwin, life sciences managing director of Accenture China.

He highlighted an example of how data could be put to better use in China's pharmaceutical marketing sector: "Consider sales reps in the field: these individuals may have an iPad for example, but it is not currently being traced in terms of measuring doctor engagement. Conversely, in the West data analytics are being applied to every-

thing, from what you look at to how long you spend on a particular page. In terms of operations, pharma spends most money on the sales force. Gathering this information could enable a more efficient sales process, for example through the use of predictive technology, to help determine which employees are most likely to leave the company. Another area we see as particularly pertinent is the use of learning technology for compliancy purposes, which essentially involves using big data to determine the greatest risks and where your auditing should therefore be more highly focused," he said.

Within the manufacturing segment of the pharmaceutical industry, cost-saving efficiencies can be better achieved through the collection of the immense amount of data generated throughout the production life



Jim Bob Ward

President and CEO
DATATRAK

Datatrak, which has the longest-standing history of any EDC (Electronic Data Capture) provider in the clinical trials industry, is expanding into China.

Can you briefly introduce DATATRAK's company history and how its core service offering applies to the pharmaceutical industry?

The DATATRAK Enterprise Cloud provides real-time business intelligence and oversight to data that our clinical research platform captures and manages from sites, patients and devices in multiple languages throughout the world. It's all about ease of use. We provide a single point of access to all your clinical data from one unified database source depending on your roles and permissions. The initial value to our

clients comes from products designed to accelerate reporting to sponsors and ultimately regulatory authorities at lower costs. The value-add comes from the analysis of your Big Data collected across pre-clinical, Phase I – Phase IV drug, device and diagnostic studies for ongoing product development.

DATATRAK created the Electronic Data Capture (EDC) market in the late 90s. This product was cutting edge at the time, but by 2006 it was becoming obsolete. As a result, DATATRAK acquired my company ClickFind, which created what is believed to be the first cloud-based clinical research platform. Our approach has been to consistently offer the latest and greatest versions of a unified system to reduce the cost and risk associated with integrating disparate systems as the industry migrates to the cloud.

Can you elaborate further on how your software solutions assist pharmaceutical companies in being more efficient?

IBM states that 90% of the world's electronic data has been created in the last two years. The tsunami of data impacting the clinical research industry is so intense that it is disturbing. Our operating efficiencies enable us to offer solutions at half the price of our global competitors. That alone is no longer sufficient. As innovators, we have adopted the leading Sisense business intelligence platform and integrated their dashboards, data visualization, predictive analytics and more into our platform, Clinical Trial Management and Electronic Data Capture products as standard or client white-labeled offerings. Both solutions help clients identify new product and protocol opportunities while saving significant infrastructure investments.

What are the key challenges the pharmaceutical industry faces when it comes to incorporating data-driven solutions into their business models?

Investors and shareholders expect sponsors to use best practices to create opportunities from Big Data. However, the overwhelming and increasing amount of machine generated data from CTMS, EDC, EMR, core lab, images, clinical de-

VICES, patient wearables, and third-party data require new storage and analytical capabilities that may go beyond their internal expertise and budget. The cost and risk increases exponentially when faced with changing country and agency regulatory responsibilities affecting the security, access and ownership oversight of Big Data.

DATATRAK has been involved in 21 studies across 19 different CROs and company sponsors within China. What is your strategy for expanding further into the China market?

Our expertise is empowering partners with our technology. Our product line can be accessed in any language and meets the requirements of any of the countries where we operate. We have a strong partnership with NTT Data. They are a well-known entity in Asia and a trusted powerhouse in Japan. Our partnership with NTTD allows us to establish a presence in China, which includes IT infrastructure, over 2,000 employees with Chinese representatives to provide sales, training, support, infrastructure, and project management. Privacy, ethics and oversight remain top concerns for our clients in China, who are looking for high quality, standardized software to protect the quality of the products and privacy of patients.

What is your final message to our readership about the capabilities of DATATRAK's software solutions and your outlook on the necessity of integrating technology into a successful pharmaceutical business model?

We are a secure and trusted provider of global clinical research solutions with over 25 years of experience. Our Cloud Enterprise platform is scalable from the basic early stage trial to the most complex global trials. Our CTMS is unique in that it will import trials from competing EDC vendors that can be measured with our business intelligence dashboard. DATATRAK is expanding into the Chinese market with an interest in creating long-term relationships. Relationships based on empowering clients to scale our technologies to their budgets and timelines that provide optimal return to investment. ■

Image courtesy of Azelis

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Both the FDA and CFDA are placing greater emphasis on data collection and monitoring, which means the production line has to become more intelligent. Communication integration between interfaces becomes very important, and it is our mandate to design such a process that enables this advanced drug manufacturing environment.

- Michael Chang,
VP,
Tofflon

72



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cycle. Conscientious data analysis can then assist in enhancing process design, ensuring both quality, which will be important to meet demands for more documentation in line with new GMP procedures, while also providing insight into how companies can become more energy efficient, for example. “Machines are becoming increasingly digitalized and, as you monitor all the data that is collected and analyzed, production can be optimized,” said Michael Chang, vice-president of Tofflon, a company focused on providing top quality freeze dryers to both China and global pharmaceutical industries. He provided an example of how data analytics can pass on savings to the client: “Previously, to perform the drying process required a heating transfer that required greater energy consumption. Today, less heating transfer is needed to achieve the

same performance because the internal structure has been redesigned to achieve the same purpose through insights gained by data analytics,” he said.

In the drug development phase, digital tools can also help to better streamline and modernize processes. Linear Clinical Research, an Australian clinical trials company, was the first in Australia and one of the first clinics in the world to go digital. The company invests in eSource and has a partnership with San Francisco-based Medrio that allows for data capture on iPads rather than by paper. The implications are enormous because these software solution companies’ products can bring significant savings to clients, while also improving the entire drug development value chain. DATATRAK Enterprise Cloud, the company behind the beginnings of the Electronic

Data Capture (EDC) market in the late 90s, offers a single point of access to all clinical data from one unified database source. This software solution accelerates reporting to sponsors and regulatory authorities at a lower cost, but further to that, enables the analysis of Big Data collected in the process to enhance ongoing product development initiatives. DATATRAK sees significant opportunity in the China market and will continue to expand its initial involvement in 21 studies across 19 different CROs and company sponsors in the country through a partnership with Japan-based company NTT Data, which already has an in-country footprint. “DATATRAK is expanding into the Chinese market with an interest in creating long-term relationships — relationships based on empowering clients to scale our technologies to their budgets and timelines



that provide optimal return to investment,” said Jim Bob Ward, president and CEO of the company.

The capabilities of machine learning and artificial intelligence-based (AI) applications are another facet of digitization that have yet to be mainstreamed in the pharmaceutical industry, but the incredible benefits of the technology are already making waves, particularly among big pharma with the resources to invest in the relatively new and therefore unverified area. “Pharmaceutical R&D is still very labor-intensive and automation has not been successfully applied to these processes. In this very special and historic period in technological progress, we predict that pharmaceutical R&D will actually skip automation and advance directly to intelligent R&D,” said Dr. Xing Li, CEO and founder of Deep Intelligent Pharma (DIP).

DIP aims to offer an end-to-end software platform from drug discovery to after-sales using the most advanced AI and blockchain technologies available. The company’s ECTD deep dossier machine can help produce electronic CTD findings in just five hours, whereas it would typically take an average of 15 days for an expert to complete the same work. However, services like this are only a single component of the value proposition DIP offers to clients. “Many pharmaceutical companies come to us seeking an application-based service, but an application is like a flower, and flowers have roots. Our first step is to help build a knowledge graph and accumulate historic materials to formulate an intelligent bottom layer of the decision-making brain. Once this has been established, on top of this you may offer different applications to serve various functions,” Dr. Li elaborated.

While currently words like “Big Data” “Blockchain” and “AI” are often written-off as buzzwords with little substance or value in the pharmaceutical industry, the



China as a market must be one of the most digitized in the world, with applications like Didi and WeChat ingrained in the social fabric. However, traditionally, all other industries have been ahead of pharma in digital adoption. For example, the digitization of clinical trials has yet to occur and is largely still handled manually, highlighting the huge gap where digital tools could be better put to use.

- James Irwin,
Life Sciences Managing Director,
Accenture China



application to drug discovery, or the act of innovation itself, is tantalizingly close and could bring immense benefits to global health care initiatives. The interest and investment in these platforms from several big pharmas is a strong testament to their importance going forward. While adoption of these technologies has been traditionally slow in the pharmaceutical industry, China is perhaps the best placed for it to occur. The extraordinary pace at which the country has shifted its entire pharmaceuticals industry towards innovation demonstrates the capacity and willingness of China to embrace disruptive changes. It is then perhaps only a matter of time — and likely a short period of it — to see what disruptions AI technologies will bring to the global pharmaceutical industry, and in turn how China will disrupt the global pharmaceutical market. ■



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We deliver a complete portfolio of software products designed to accelerate the reporting of clinical research data from sites to sponsors and ultimately regulatory authorities, faster, more efficiently, and more affordably than other loosely integrated technologies. The DATATRAK ONE software solution, deployed worldwide supports Preclinical and Phase I – III, Late Phase drug, device and diagnostic studies in multiple languages throughout the world.

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- Business Intelligence
- Clinical Trial Management
- Electronic Data Capture
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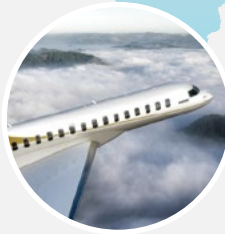
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