China Series

LIFE SCIENCES edition

启迪英国 TUSPARK UK

Enter the Genomics Industry in China

November 2021

In the fourth workshop of **TusPark UK**'s **China Series – Life Science Edition**, we covered an exciting industry in China: **Genomics**. We invited ***Rouse***, who spoke on the important subject of Data Privacy Laws in China (which is highly relevant for genomics and digital health companies who work with data). We were also joined by two leading genomics companies in China: **Novogene** and **Jabrehoo**, to discuss what the genomics industry is doing in China and where it is going. **Congenica** from the UK also shared their work and experiences in the Chinese market. This event was proudly co-hosted by us together with our partners **P4 Precision Accelerator** and the **Wellcome Genome Campus**.

Here are some highlights from the workshop:

Improve life and health outcomes through science, innovation, and entrepreneurship

The Wellcome Genome Campus was founded in the early 1990s by the health-focused charity Wellcome, as part of the global effort to sequence the human genome and to be part of the first exploration into genomics. It is home to two leading research institutes: the Wellcome Sanger Institute and the European Molecular Biology Laboratory-European Bioinformatics Institute (EMBL-EBI) who are both working very closely together on this human genome mapping project.

The Wellcome Genome Campus has a vision of being a world leading innovation ecosystem for genomics. It has a small innovation centre on the campus: the BioData Innovation Centre, which is home to 9 companies and teams that are innovating in dynamics and bio data, including Congenica.

WELLCOME GENOME CAMPUS

Alongside that the campus also has a stimulating entrepreneurial culture on our campus through delivering inspirational events and initiative. It's our scientists on campus who embrace innovation and entrepreneurship, so we would like to go start at school for scientists and others on campus to help them explore genomics and data ideas and unlock their entrepreneurial potential and skills, so that we can hope that this science does realise an impact.

—Dr Joanna Mills

Head of Entrepreneurship, Wellcome Genome Campus

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China's New Data Laws & Impact on Business: Considerations for China Market Entry

Speaker: Holly White,
Consultant, Rouse

1. Overview of China's data laws

It is significant but complicated to make sense in terms of the new whole system approach that China is building. The impact of China's new data ecosystem depends on individual business models.

- **Data type and scale:** It depends on what data type and quantity, and there are certain set of rules and regulations that will apply to your business.
- **Data flows and cross border transfer:** How your products and services are collecting data, how that is transferred, and who it is shared with will all have impacts.
- **Service provision:** What you are delivering (software/data collection/platform for others to use) will impact how you set up in the Chinese market.
- **Customer:** The bigger the companies are, the stricter the requirements on managing their data they have.
- **Ongoing development of regulations:** A constant evolution of regulations is being released and you need to stay up to date with what is going on.

China's legal framework on data and network security consist of three laws and these laws all interplay with each other.

- ***Cybersecurity Law:*** This law contains general principles for cyberspace, the first law came out a few years ago with established basic principles.
- ***Data Security Law:*** This takes data security as the core and looks at different factors, categories of data, and how they should be handled, released in June 2021.
- ***Personal Information Protection Law:*** This law refines and improves the processing rules and protection scope of personal information that has just come into force.

The laws categorise different types of data in different levels.

Red – **Important data** (without a set definition) could be sensitive in China, such as data of Chinese economic security or growth or public interests, geographical data and health/medical data; **Personal data** is considered sensitive when it affects people's privacy or can be used to identify individuals such as bank details, ID numbers, etc.

Amber – **Scientific data** includes research data produced from basic and applied research across the range of disciplines, which may be hard to export or need to be submitted to a national data centre.

Green – Public datasets and **General data** that is not covered by specific regulations can continue to be used.

2. Two key issues: Personal information & Data localisation

The purpose of Personal Information Protection Law is multifaceted:

- Protecting consumer rights
- Establishing platforms' responsibilities
- Promoting digital ecology
- National data security

Where does it go above and beyond GDPR? Is there for sensitive information collection and certain additional uses of data such as transferring to third parties or transferring overseas? This requires additional consent and that is something that a lot of companies are thinking about now.

International businesses should assess the need to localise data. The cross-border transferring data localisation rules can be seen in both the Data and the Personal Information Protection law. The government review for cross border transfer of data basically falls into two types. The first depends on the **data type** you are dealing with, as discussed earlier. The other depends on the **provider type**. There is a term called **Critical Information Infrastructure Operators (CIIOs)**, referring big digital platforms that hold huge amounts of data, who need to be reviewed by the government before they can transfer any data overseas. The additional regulations have expanded the definition of CIIOs which can has a greater impact for more companies than before.

Thus, **there will be more challenges for international businesses.** The **approval process** could be lengthy and impractical. The **government approval** is likely to be challenging and it is untested because the system hasn't really been up and running yet. Even if you have a **lack of government approval**, there will be still extensive legal requirements to seek individual approval.

3. Responding to China's data laws

Regarding data localisation, there will be more implementation actions required.

- **Data compliance risk assessment & rectification:** Data audit needs to be conducted to assess compliance with data requirements and identify rectification actions.
- **IP Risk & Business Model Assessment:** Before choosing a busines model, an IP risk assessment should be considered for each option.
- **IP and Control Strategy:** Once a business model is chosen and vulnerabilities are known, IP and Control Strategy need to be created and implemented.

IP Risks factors in data localisation and beyond shall be considered to avoid the leakage, loss, and theft of your IP.

- **Partners and business structures:** You need trusted partners and legal structures (WFOE, JV, Licensing) to best protect IP.
- **Third parties:** The management of third parties (e.g. suppliers and distributors who have close access to IP) is important.
- **Industry regulations:** It is also significant to consider industry and market specific requirements which dictate certain handling of IP.
- **Competitors:** You need to prevent competitors (especially where the third parties) to use IP without the rights.

IP and Control Strategy should address highly vulnerable touch-points. Here are the **Control Mechanisms** we would like to share with you.

- Software patent strategies
- Software copyright registration (required for certain online products)
- Design controls to prevent unnecessary access
- Control points concerning partners and third parties: due diligence; licensing model selection; contract terms
- Control points concerning China subsidiaries: employee IP acknowledgement agreement; non-compete agreements and exit undertakings; internal IP control measures

About Rouse

Established in the UK in 1990, Rouse is a global leading IP services business operating in different challenging markets all around the world. Rouse has been in the China market since 1993, bringing the perspective of how people can use and protect their IP within the business context. The firm is passionate about working with clients from a broad range of sectors with diverse business interests and needs and helping technology businesses take their innovations to commercialism.

Driving Forces in Genomics Sector in China

Speaker: Tingting Zhou
Vice President, Novogene

The genomics market in China is growing extremely fast in recent years. Especially since the pandemic, the unprecedented amount of equity investment in research funding has boosted the industry. According to *Illumina Annual Report 2020*, the genomics market in China is estimated multibillion dollar, accounting for more than 10% of the global market.

Here are the driving forces that we observed in the Genomics industry in China.

1. Single cell sequencing

It is showed that the number of publications using single cell RNA sequencing is growing exponentially. So far 10X Genomics is a dominant player on single cell RNA-seq technology which enables us to study the cell-specific transcriptome profiling at a massive scale. There have been potential competitors of this area in China. A company named Singleron, based in Nanjing, Jiangsu recently raised near 100M US dollars in the series B financing.

2. Multi-omics

Multi-omics is another hot topic today. By integrating data from genomics, epigenomics transcriptomics, proteomics, and forceful proteomics, it can provide a comprehensive understanding to the molecular mechanisms underlying a certain phenotype. In the context of precision oncology, there will be more opportunities for precise diagnosis and treatment.

3. Long read sequencing

Long read sequencing is also growing in China. Novogene is providing long read sequencing services based on the platform PacBio Sequel II and ONT PromethION. There are two major applications of long read sequencing: genome assembly and more comprehensive variant detections.

4. Clinical NGS in oncology

Another driving force is clinical NGS in oncology. It is estimated that the market value is around 400M US dollars, with the CAGR of over 50%. The major players are trying to secure a position in cancer screening in the Chinese market. In addition, there is a trend of decentralisation of NGS assays. Novogene also delivers a business model of in-house facility setting up in major hospitals so that they can better control data and process.

5. mNGS in infectious disease control

RT-PCR testing is a major and effective tool used in precision elimination of COVID-19 in China. Besides, there is a trend of using mNGS to identify unknown pathogen and understand its antibiotic susceptibility to conduct a more effective treatment.

6. Intelligent lab

Novogene developed and launched one of the global-leading intelligent delivery platforms for multi-product next generation sequencing. It consists of 66 equipment and fully automates the whole process from sample extraction, library preparation, sequencing, and all the way to bioinformatics analysis. As a one-stop fully automated solution, it can process up to 3,000 samples per day and reduces the turnaround time by 60%.

Photo By: Novogene

7. Regulation and policy

The regulations and policies are also shaping the genomics market in China, such as the Regulation on the Administration of Human Genetic Resources, Data Privacy Law, the 14th Five Year Plan, the NMPA Approval for the medical products, and the updates of National Reimbursement Drug List. In addition, the "Zero COVID" Approach taken now will also affect overseas businesses planning international travel.

About Novogene

Novogene

Advancing Genomics, Improving Life

Novogene was founded in 2011 by Dr Ruiqiang Li with a mission to be the global leader in providing genomic services and solutions. We completed the IPO at the STAR Board of Shanghai Stock Exchange early this year, which is a milestone for us on our 10th anniversary. There are three core businesses in Novogene: Research Services (NGS, single cell technology and proteomics, etc); Clinical Services (Oncology, Rare disease and Infectious Disease); IVD and Research Products. As the largest NGS service provider headquartered in Beijing, Novogene also expanded its global network and established overseas subsidiaries and labs to serve more customers from over 70 countries and territories including US, UK, Singapore, Netherlands, Japan, and Thailand.

How to Conduct NGS & ART Business in China

Speaker: Jia Fei

CEO, Jabrehoo

1. The Development of PGT-A Technology and Platform

The first generation of PGS (Preimplantation Genetic Screening) methods was FISH (Fluorescence In Situ Hybridization) which could only test 5 to 9 chromosomes per time whereas there are 23 parallel chromosomes in a human cell. Since then the technologies such as aCGH (array Comparative Genomic Hybridisation) and Kartomapping have emerged yet these

these methods cost a lot and took a long time. In 2013, the third generation of PGS came to the world and was incorporated into the NGS for the first time, which performed well and showed great potential. In the same year, Jabrehoo became the first company in mainland China that successfully developed the application independently, which in turn led to the clinical application and transformation of the third generation of IVF in mainland China. The sequencing technology applied by the company has also expanded from the initial Semiconductor Sequencing to the Reversible End Termination Sequencing and the combinatorial Probe-Anchor Synthesis (cPAS)-based Sequencing. The company successfully realised the clinical transformation on cross-platforms and multi-platforms.

In 2017, the international organisations started using PGT-A instead of PGS, so we now have PGT-A which means Preimplantation Genetic Testing for Aneuploidy, PGT-M for Monogetic diseases, and PGT-SR for Structural Rearrangements. Note that the authorities in China still use PGS/PGD.

At present, in terms of of PGT-M and PGT-SR, Jabrehoo has also extended the application of the third-generation sequencing platform to difficult cases in addition to the well-developed NGS and Gene Chip.

2. The Growth of PGT & ART Market in China

The PGT service is rapidly growing in China, especially in recent 10 years. For example, the Penetration Rate of PGT in Guangdong province grew from 1.3% to 4.1% from 2009 to 2017. It is estimated that the market will continue growing in the coming years.

In 2020, Chinese Centre for Disease Control and Prevention published the data (which was reported by over 450 reproductive centres in 2016) in the

international journal Human Reproduction. Then China was confirmed as the "World's most Prolific ART Nation" by ICMART (International Committee Monitoring Assisted Reproductive Technologies). China has the largest number of ART Cycles in the world, accounted for 27% of the global market. The IVF market is still growing as Chinese people tend to marry and have children later.

3. Class III Medical Device Registration Certificate of PGT-A Kit

Class III medical devices are strictly regulated by NMPA (National Medical Products Administration) in China. In 2016, Jabrehoo's PGT-A kits entered the NMPA's special approval procedure for the first batch of innovative medical devices, then went through rigorous clinical trails & research in the next five years. Based on the clinical trail data of 4,640 embryos of 1,221 eligible subjects, as well as strict quality control, Jabrehoo obtained the first Class III medical device registration certificate of PGT-A Kit utilising the Reversible Termination Sequencing technology in China in 2021, and its PGT-A Kit became the only dual-certificated PGT-A test by the NMPA and the CAP (College of American Pathologists).

Photo By: Jabrehoo

4. The Regulation and Current State of Assisted Reproduction Centres in China

In China, reproductive centres must obtain the approval from the National Health Commission to carry out the PGT business. The relevant qualifications are obtained gradually: firstly, it is necessary to be qualified for the IUI (intrauterine insemination) business; then the centres can apply for IVF (In vitro artificial insemination) and ICSI (intracytoplasmic sperm injection) qualifications under certain conditions; PGS/PGD qualifications can only be applied when meeting more stringent conditions (number of cycles, pregnancy rate, doctor title, prenatal diagnosis centre). Up to now, only 82 out of the 570 assisted reproductive centres obtained the qualification of performing PGS/PGD in China. There is considerable potential of the PGS/PGD market in China on account of the Third-child Policy and the governments' support to build more productive centres.

5. PGT Localisaton Strategy

The data of the embryo, cell, and sequencing is regulated by the authorities in China such as the Administrative Regulations on Human Genetic Resources of the PRC, so this type of samples and data shall be kept in laboratories and should not be disclosed. Our PGT Localisation Strategy has been bult to satisfy the requirements. Firstly, the DNA amplification after embryo biopsy and the wet test process of building the database and putting it on the machine are completed in the PCR amplification laboratory of the hospital. After the data is off the machine, the hospital have two methods to obtain the sequencing results: one is to upload the original data to PGXCloud, the cloud platform whose intellectual property rights are owned by Jabrehoo independently (the ownership of the data still belongs to the hospital); the reports can be generated and downloaded directly after the platform complete the calculation. The other is to use PGXStation, the server in the hospital, to process the original data and generate the reports. We are expected to become the only company that has obtained the NMPA registration certificates for sequencers, kits and analysis systems in the first quarter of 2022. We are also equipped with a professional team to provide hospitals with integrated and comprehensive support from experimental procedures to bioinformatics analysis, genetic consulting, etc., so that the full process from sampling to report generation can be completed locally, to ensure the compliance and safety of the samples and data.

About Jabrehoo

Founded in 2011 in Beijing, Jabrehoo is an integrated platform for the fields of reproductive genetics and maternal and children's health. Jabrehoo is dedicated in combining high throughput sequencing technology and big data technology with clinical applications. The company is leading in the ART (Assisted Reproductive Technology) and PGT (Preimplantation Genetic Testing) markets in China, with its ART more than 250 related supplies and services covering assisted reproduction centres in China and PGT service supporting over 80% of the centres in mainland China that have been approved by the state to carry out PGS/PGD.

Congenica: Observations and lessons we learned in China

Speaker: David Atkins
CEO, Congenica

1. Congenica's motivation to invest in China

- China is a major growing Genomics market that is emerging incredibly quickly. There is an **increasing appreciation of the contribution that genomics** can make to healthcare, not only in terms of providing better outcome to patients, but also reducing the cost of care.
- There is a **rapid adoption of genomics in routine healthcare**, which may be a little bit difficult in some other markets because of the entrenched established methods.
- China has an incredibly **strong domestic industry** that is driving the appreciation of the benefit of genomics in, both in the research and in the clinical setting.
- The **government has significantly recognised the opportunity** to use genomics to improve the standard of care in rare disease, in cancer, and in maintaining wellness and predicting risks.
- From both the private and public sectors in China, there have been a **significant investment** in really changing the standard of care for rare disease.

2. Key steps along the way

- **Establish local contacts**

We firstly started building local contacts, developing a local presence for us and making connections with the senior governments, in both provincial and national level in China, as well as building a network of contacts with other businesses.

- **Establish WFOE**

Then we made a big effort to establish a wholly foreign owned entity in in China, with a lot of administrative work completed. It is an important step for companies outside of China to have the entity.

- **Recruit local team**

We have prioritised investing in people who are local, know the market, and have the right network. We have also benefited from hiring experienced leaders who brought a lot of genomics-based experience into the China team.

- **Be patient**

For small, medium, or big size companies moving into any new market, it always requires patience and there is no difference in China. It has been an incredible journey of discovery for all the team within Congenica who have participated in helping kick-start the business for us in China and to continue to support as it grows. China is a place where everybody always returns and has learnt something.

3. Observations and lessons learned in China

Exporting into a new market is always difficult from afar. The critical requirement is to make local friends. Do not try and do something by email or WeChat, you need to have a local presence.

Global commercial goals and ambitions generally overlap. Everyone's goals and ambitions generally are very similar whether you are doing business in China, Africa, or Middle East, but what you must really appreciate is to respect the differences. Those differences can be anything from social and local norms and behaviours to accounting regulatory difference.

For small businesses, exporting can be incredibly costly. It is a big decision to move outside of your domestic market, but I would encourage everyone to do, especially the UK based companies. The UK government invests heavily to support companies, particularly tech and science companies, to build a footprint internationally. We have benefited from a lot of support from the Department of Industry and Trade. And there is a whole raft of Chinese companies who have presences in the UK like TusPark that can be incredibly helpful to do some of those very straightforward but difficult things if you are not in China: to find your local friends, the local network and make the first step so call on those.

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China Series – Life Science Edition is designed to support life sciences companies in the UK entering the China market through soft-landing and business partner networking. We have covered Medical Devices, Pharmaceutical, Digital Health and Genomics. This series will continue with further talks on areas of AI Health and more.

If you would like to hear from us with regards to our future events, news and any updates, please following us on LinkedIn, Twitter and WeChat. We are looking forward to seeing you in next event.

Contact Us

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About Congenica

Congenica
Enabling genomic medicine

Spun out from the Wellcome Sanger Institute in 2013, Congenica is focused on making personalised medicine be a routine and integrated part of healthcare. With deep expertise in genomics data analysis, Congenica has contributed to providing the capability to identify information amongst genomics data, to be able to support a broad range of clinical decision-making and the drug discovery. Congenica's high-quality clinical decision support platforms, as medical devices indicating rare disease diagnosis, have been validated with the NHS and now are used in over 20 countries, including China. Now they are expanding their commercial footprint through leveraging their capability in drug discovery.