Establishing and Scaling an Efficient Genotyping Facility

Prenetics created a high-throughput genotyping laboratory to serve its growing customer base in Southeast Asia.

Introduction

Lawrence Tzang, PhD created custom gene expression microarrays while a PhD student at the City University of Hong Kong. “During my postdoc studies, I developed microarrays for my research studies,” Dr. Tzang said. “However, I was always more interested in applying the technology to serve and make a difference for society.” He was encouraged and supported in this effort by his City University PhD supervisor, Prof. Michael Yang. Together, they founded a molecular diagnostics testing company in 2009.

After achieving modest success, Dr. Tzang joined forces with successful entrepreneur, Danny Yeung, who was previously the founder and CEO of Groupon East Asia. Together, they renamed the company “Prenetics” to reflect their vision of disease prevention through genetic testing. Today, Prenetics has evolved into one of the leading genetic testing and digital health companies in Asia. Prenetics chose the Infinium™ Global Screening Array (GSA) as the foundation for testing panels focusing on nutrigenomics, pharmacogenomics, and chronic disease screening. The company also began working with the Illumina ArrayLab Consulting Service to plan a scalable high-throughput genotyping laboratory that could meet their needs today and in the future.

iCommunity spoke with Dr. Tzang about how ArrayLab Consulting Service assisted Prenetics in capacity and resource planning, laboratory setup, inventory, hardware, and data management of its new genotyping laboratory.

Q: How did the DNA testing company that you founded in 2009 evolve into Prenetics?
Lawrence Tzang (LT): In 2009, I founded Multigene Diagnostics Limited. At the time, it was one of just a few diagnostics labs in Hong Kong. Our business model was focused on hospitals, clinics, and conventional laboratories that did not have DNA testing capabilities. The business grew modestly as physicians learned about, and began to accept, this new method. During this time, we had limited success commercially. We didn’t have any members of our team who had business expertise.

In 2014, we had a great meeting with entrepreneur Danny Yeung. Our missions were aligned. We both wanted to make a difference in society. Through subsequent meetings, Danny decided to invest in the company and joined Prenetics as Chief Executive Officer. We changed the company name to Prenetics, identified key product value propositions, and set out with a new business model. Our focus shifted to the creation of amazing products that produce tangible outcomes for our customers. We scaled the company quickly.

Q: When did Prenetics begin developing its own microarray panels?
LT: In 2015, we focused on developing pharmacogenomics, nutrigenomics, and cancer genomics tests. We converted our technology platform from real-time PCR to genotyping microarrays and next-generation sequencing (NGS) platforms. We became interested in using Infinium BeadChips as the foundation of our products.

Q: Why did you choose the Infinium GSA?
LT: We knew that we would be testing large sample sizes and needed a high-throughput technology to scale up the business. We performed comparison studies of the Infinium GSA and a microarray from another company. We compared how the two technologies performed with our main sample types–saliva and buccal swabs. We found that the other product had sensitivity and specificity problems with these samples. We obtained > 99% accuracy with the GSA, which gave us the confidence to choose it as our platform in early 2017. The GSA workflow can also be automated, which will enable us to scale the business as we grow.

Q: Why did you choose the ArrayLab Consulting Service to set up your laboratory?
LT: We were unfamiliar with what it would take to create a scalable, Infinium BeadChip high-throughput genotyping platform. We didn’t have the experience with Infinium BeadChips to make throughput projections and equipment and resource estimations accurately. That included determining how many days per week we’d need to perform testing. The information was critical for us to establish the laboratory and meet testing throughput demands.

Lawrence Tzang, PhD is cofounder and Chief Scientific Officer of Prenetics.

Q: What has been your experience working with the ArrayLab Consulting Service?
LT: We began working with the ArrayLab Consulting Service team in July 2017. We benefited from the team's expertise in capacity planning and equipment and staffing assessment. It would have taken us months to figure that out and there was a high probability that we would have made errors in our calculations.

We started with a sales study to estimate our initial throughput needs. The ArrayLab Consulting Service team then provided guidance on how many systems and GSA panels we would need and the staffing requirements for running them. We are now testing approximately 2000 samples per week.

> "We benefited from the ArrayLab team's expertise in capacity planning and equipment and staffing assessment. It would have taken us months to figure that out..."

Q: What products does Prenetics offer?
LT: Prenetics is focused on developing products that support better health through prevention, identification of potential health risks, and health monitoring. In 2017, we developed customized GSA panels for nutrigenomics, pharmacogenomics, cancer genomics, and family planning screening. We have more products in the pipeline.

Q: What is your turnaround time for sample processing?
LT: Our turnaround time is about 10 days. However, that doesn't include sample delivery and consulting time.

Q: What software do you use for data analysis?
LT: We use Beeline™ software and GenomeStudio™ Software to analyze the data. It took us awhile to make sense of the manifest files. We initially used GenomeStudio Software to analyze the 700,000 single nucleotide polymorphisms (SNPs) on each chip. It took us six hours to analyze 600 samples. It was taking too much time.

We realized that for our service offering, we only needed to analyze part of the SNP data for report generation. We began using Beeline software at the end of 2017 and have seen a significant reduction in analysis time. We can analyze almost 600 samples in one hour.

Q: What are your goals for the future and how is the ArrayLab Consulting Service team assisting you in planning?
LT: In 2018, we plan to launch products and consulting services in the Philippines, Indonesia, China, and Europe. We view ArrayLab Consulting Services as a partner. We're already talking with the ArrayLab team about increasing our throughput to > 2500 samples per week and what equipment we will need to achieve that. It's beneficial to speak to our ArrayLab team lead, Charit Pethiyagoda, periodically as we prepare to grow the business to the next level. He's provided sound professional advice based on his own experience and what's been successful at other laboratories that are using Illumina systems and products.

In 2018, we'll also be working with the ArrayLab team to automate the sample prep workflow to track samples through testing and data analysis. We'll be adding a barcoded sample tube tracking system and the BaseSpace™ Clarity Laboratory Information Management System (LIMS) to track samples and optimize our workflows.

In addition, we're talking with them about transitioning to the new Illumina Asian Screening Array (ASA) that is in development. It includes markers specific for Asian populations. We hope to switch to it in 2018 and use it to develop new products.

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Learn more about the products and services mentioned in this article:

Infinium Global Screening Array, www.illumina.com/products/by-type/microarray-kits/infinium-global-screening.html.

Asian Screening Array (ASA), www.illumina.com/products/by-type/microarray-kits/infinium-asian-screening.html

ArrayLab Consulting Services, www.illumina.com/services/instrument-services-training/consulting.html.

Beeline Software, www.illumina.com/techniques/microarrays/array-data-analysis-experimental-design/beeline.html

Genome Studio Software, www.illumina.com/techniques/microarrays/array-data-analysis-experimental-design/genomestudio.html

BaseSpace Clarity LIMS, www.illumina.com/products/by-type/informatics-products/basespace-clarity-lims.html.

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