

DiaCarta: Democratizing the Diagnosis Process

“Well-being of individuals around the world,” say Dr. Aiguo Zhang Founder and CEO and Dr. Michael J Powell, CSO of DiaCarta, is one of the collective passions that they both shared that has kept California based DiaCarta up and running—a firm that provides highly sensitive and advanced technologies to improve the way molecular diagnostics and translational genomics impact healthcare treatment plans.

In an interview with CIO Applications, Dr. Powell and DiaCarta’s Founder and CEO Dr. Aiguo Zhang shared their insights on the company’s product offerings and solutions that bring a difference to the world we live in.

On the primary challenges experienced in the life sciences industry.

One of the primary challenges that have taken center-stage in the life sciences space is the integration of latest technologies such as AI into a unified platform. Despite the advancement in technologies, none of these can be leveraged at the moment to monitor people’s health and cure diseases. Especially in the case of cancer, which if diagnosed early can be cured.

For instance, if one suffers from colorectal cancer (CRC) and it is diagnosed in the early stages of the disease (Stage 1 and below), there is a greater than 90 percent chances that the patient will survive after surgical resection of the tumor. However, if it is diagnosed at the later stages, especially after the tumor has spread to other parts of the body the chance of the patient surviving is reduced considerably.

From the diagnostic perspective, one has to undergo colonoscopy test to identify if he has colorectal cancer, but most patients do not want to experience this test as it is expensive and time-consuming. The challenge today is in finding technology that can allow sophisticated high-level molecular testing to be brought down to a status wherein

it can be done in a local hospital pathology laboratory. For instance, somebody in Tennessee has to travel all the way to get diagnosed and tested in the central hospital because the cancer test facilities are unavailable at the local hospital. DiaCarta aims to democratize the diagnosis process by globalizing it and providing it to local hospitals and oncology clinics world-wide so it is accessible to everyone.

What are the different processes followed by your company in diagnosing cancer?

DiaCarta’s strategy is to deliver the right diagnosis to understand the tumor on the same day a patient walks-in to get checked. Unlike most organizations that perform paraffin processing to get the tumor tested in pathology labs, DiaCarta’s technology enables us to understand the genetic landscape of tumor through the patient’s bloodstream. We can dynamically monitor the patient’s tumor DNA through the bloodstream and examine the changes that occur over time during the course of treatment.

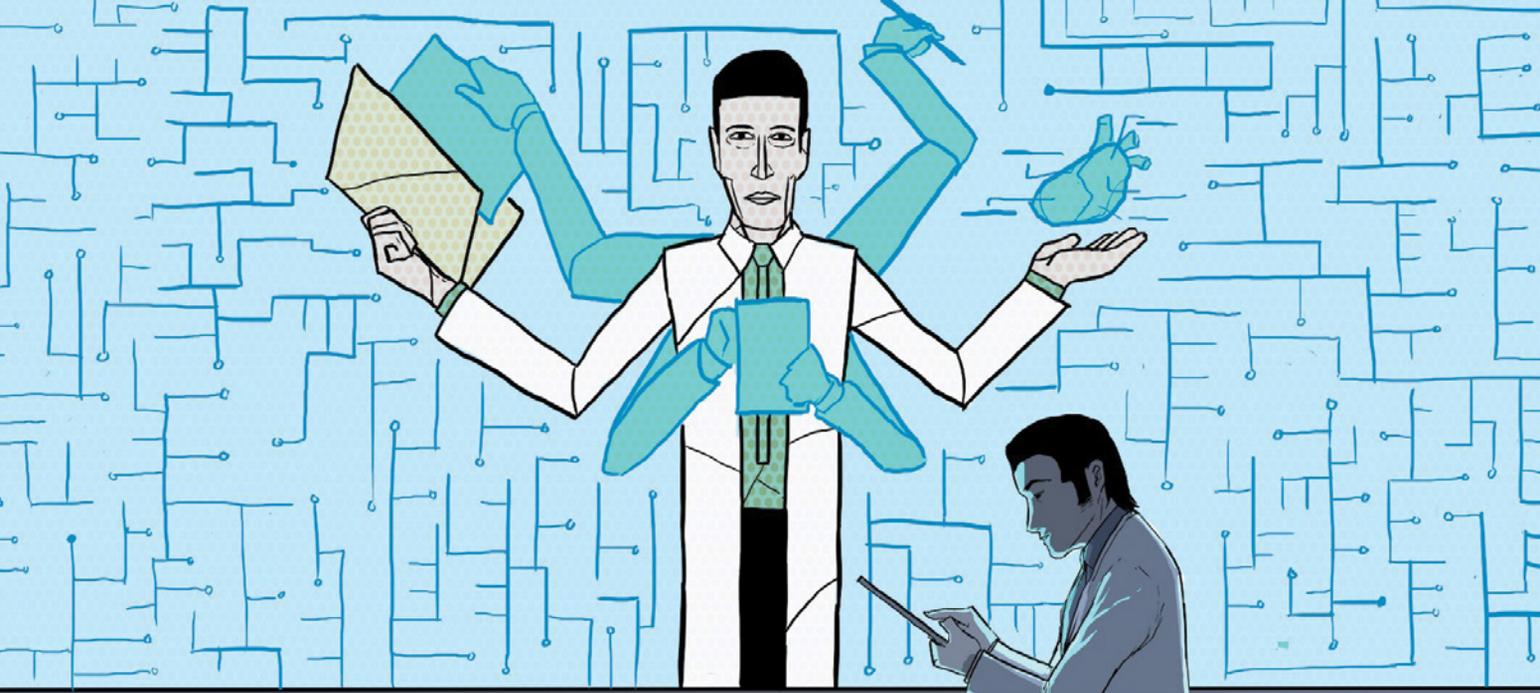


DR. AIGUO ZHANG,
 FOUNDER AND CEO

DR. MICHAEL J. POWELL,
 CSO

What according to you are the disruptive trends that exist in the life science space?

One of the disruptive trends in the life sciences space is the company “GRAIL” started by Illumina with investment funding of over \$1 billion. GRAIL a spin-out from Illumina and finds tumor derived variant nucleic acids (needles) in the bloodstream of patients and conducts ‘deep sequencing’. Today in employing deep sequencing, NGS molecular testing labs have to do 10’s to 100’s of thousands of ‘reads’ to find the variant tumor derived nucleic acid molecules (needles) present in a sea of the patients wild-type molecules (haystack) and most times, there are errors in sequencing, and this is time-consuming and costs money. To mitigate the loopholes in deep sequencing, DiaCarta has developed Xenonucleic Acid (XNA) Molecular Clamp



Technology that hybridizes by Watson-Crick base pairing to target DNA sequences. Based on its proprietary XNA-powered NGS library preparation technology DiaCarta scientists selectively enrich the low frequency genetic variants present in the DNA derived from the patient and block the polymerase enzyme from amplifying invariant 'normal' (wild-type) background DNA. This allows us to perform minimal NGS reads to find these low frequency variants and a result can be generated within 48 hours. The data can be analyzed rapidly with standard software analysis programs without extensive bioinformatics to 'smooth' out the noise from wild-type reads and this leads to increased reliability of detection of low frequency tumor derived variants.

What are the different solutions offered by DiaCarta?

DiaCarta has a colorectal cancer (CRC) testing kit that can conduct a blood-based test to monitor the recurrence of CRC and for early detections as well. We also have a product called 'RadTox' which utilizes DiaCarta's other flagship molecular testing technology called 'Super branched DNA' (Super bDNA). Unlike our QClamp XNA-PCR, which is a target amplification technology, bDNA is a signal amplification technology. bDNA uses highly specific molecular probes to monitor circulating free DNA from patients' blood samples who are undergoing targeted radiation therapy or immunotherapy. RadTox is able to monitor the toxicity and efficacy of radiation or immunotherapy treatment that a patient undergoes. Additionally, DiaCarta has operation in China with a clinical laboratory and sequencing center where they are engaged in a very large China population based whole genome sequencing (WGS) project. The company also has the fastest and most sensitive method to screen CRISPR/Cas based gene editing with an XNA-qPCR test called 'CRISPR-Quest' that can be

used for determining gene-editing efficiency and gRNA compatibility for the targeted gene loci being edited. DiaCarta is also very capable in developing and supporting companion diagnostic tests for both preclinical and clinical NGS and qPCR testing in its San Francisco Bay Area ISO/CLIA facility and clinical facility in Nanjing, China.

State a case study wherein DiaCarta was instrumental in addressing a key challenge faced by a client.

We assisted US FDA research group in finding low-frequency mutations for breast cancer using our XNA technology which was published in the Journal Neoplasia. We also helped clinical researchers at Fred Hutchinson Cancer Center (FHCC) in Seattle to develop a highly sensitive test for detection of minimal residual disease (MRD) in hematological malignancies. Through a collaboration with the Olivia Newton John Cancer Research Institute in Melbourne the detection of extremely low frequency secondary resistance mutations in lung cancer tissue biopsy samples was enabled using XNA-enhanced pyrosequencing which was published in Clinical Chemistry Journal August last year.

Tell us about the plans for DiaCarta?

We want to be a key player in the field of precision medicine and make it affordable to ordinary people. Our technology has made liquid biopsy come true and improved the way molecular diagnostics and translational genomics impact healthcare treatment plans. Moreover, we are developing and commercializing point-of-care sample processing and testing for cancer patients. With the big data from large population of WGS we are doing in China and globally, we are also leveraging artificial intelligence (AI) to transform the world of molecular and precision medicine to improve people lives globally. **CA**