

# Interview: Yaron Turpaz - Chief Information Officer (CIO), Human Longevity, Singapore

---



***"The overall idea behind Human Longevity is to transform healthcare and to shift the focus into preventive healthcare."***

---

11.11.2016

Tags: [Singapore](#), [Human Longevity](#), [Big Data](#), [Healthcare](#), [Genome](#), [Digitalization](#)

---

*As a bio-informatics connoisseur with extensive experience in the pharmaceutical and clinical research field, Human Longevity's Chief Information Officer, Yaron Turpaz, shares his insights on the company concept, the value proposition of big data in healthcare, as well as the overarching vision for the company's bright global future.*

**In a world of big data, there is a plethora of opportunities for a company like Human Longevity to thrive. As an introduction to our global executive readers, could you please describe the inspiration and rationale behind the company?**

The overall idea behind Human Longevity is to transform healthcare and to shift the focus into preventive healthcare. Currently, healthcare systems globally are best defined as "sick care". Typically, the series of events is that the person gets sick, the symptoms show, then goes to the doctor. For chronic diseases such as cancer, Alzheimer, and cardiac diseases, the visibility of the symptoms already means that the disease is in advance stages. It is much harder to cure diseases and reverse or slow the changes once they have progressed. The idea behind HLI is to accelerate an earlier disease detection and prevention based on the development of the right disease-risk models, which is fundamentally anchored on genomics, though not limited to it.

At the crux of the company is to translate genomics into thorough insights and predictive models of disease in order to develop a research protocol on how to provide the utmost prevention, care and

treatment for the disease. Through HLI's Health Nucleus we are developing the first proof of concepts to demonstrate the value of omics and big data into medical applications for preventive healthcare, we will then scale up globally and lead the transformation of healthcare and the advancement of personalized medicine.

The way in which we developed the business was through building the largest human genome sequencing facility in the world, which is headquartered in San Diego. One of our Founders and CEO, Dr. Craig Venter, was one of the first scientist and thought leader involved in sequencing the human genome since the early 2000s. The idea behind the company is to tap on an inflection point and advancement of major technologies such as Next Generation Sequencing (NGS) and Cloud Computing, and create a paradigm shift in the entire industry.

**What were the important market and scientific trends that drove a research activity such a genome sequencing into a marketable product?**

There were two influential factors which facilitated our entry to market. Firstly the significant decline in the cost with an increase in quality and speed of sequencing had set the genesis for later commercialization. Approximately 15 years ago, it cost 100 million dollars to sequence a single human genome in a span of one year. Today, between one to three thousand dollars, a sequenced whole genome could be generated in merely three days. With proper instrumentation and technology, we are able to operate in scale. This is highly significant as one of our mandates is to generate deeper insights at the level of a population. Secondly, another important factor is the cost and speed of computing. With the rise of cloud computing, high throughput data, which are critical for healthcare, can be generated, stored and analyzed at almost real-time. These dynamics were never possible before. Now is the most opportune time to establish a large multidimensional knowledgebase of information, which is integrated across multiple domains and modalities.

[Featured\_in]

The whole genomes consist of the entirety of the six billion base pairs, namely, the A, C, G and T base pairs for every individual, who inherits three billion bases from the father and three billion bases from the mother. This is a vast amount of genetic information, that HLI is specializing in sequencing and analyzing. In contrast to whole genome sequencing, genotyping microarrays which other companies focus on, only generates one million common genetic variants for a single individual, which is less than 0.02% of the human genome. The next level of genome sequencing provides the whole exome, which are the regions of the genome that codes for proteins. Though these regions carries critical data, it only consists of less than 2% of the human genomic

information, which means that there is still a significant amount of data (98%) yet to be studied. It is worth noting that more than 80 percent of the current genomics knowledge available today is extracted from these exomic regions and the latest focus of whole genome analysis is likely to provide major scientific and medical breakthroughs in the coming decades. Nonetheless the whole genome information that we already have today has been critical in building exciting machine-learning and analytics approaches towards the ultimate goal to extend healthy living and create novel preventive and personalized approaches to healthcare.

In addition to the whole genome, we also generate the whole metagenome of the microbiome, generally sourced from stool samples or from the skin or saliva. Most of the companies conducting such studies focus on a single bacterial gene called 16S, which helps determine the species of bacteria. Knowing that a single gene analysis isn't sufficient, we study the whole metagenomes of all the bacteria in each sample to provide detailed insights of substrains of bacteria and comprehensive biological pathway analysis. Being aware of these distinctions could be pivotal in determining one disease over another. There is an increasing amount of evidence conveyed through scientific literature that the number and species of bacteria in the gut could be significant factors for diseases such as diabetes, cardiac, autoimmune or neurological diseases. Accumulating this data does not only carry potential for diagnostics, but as well as provide innovative insights for targeted treatments, at the granular level of knowing which mutation, pathway and bacterial population to manipulate.

**What are the main challenges of curating genomic data at this scale? How do you mitigate these challenges in a way that offers you a competitive advantage to other players in this space?**

One of the biggest challenges of public databases and companies gathering genomic data is that they typically only have the genome, and this information is not linked to the demographic and longitudinal health profile of the person. Information is captured in silos at different academic and health information centers. Our key mission is to generate and integrate such sets of data, analyze the variables' relationship to each other and translate it for comprehensive care to patients. There are plenty of companies in the field who provide a fee for service sequencing of DNA. These companies focus on a markup model of the sequencing costs and do not retain the data. Our business model is to embrace our large scale sequencing capabilities through close collaborations with institutions and corporate partners, and provide the sequencing service at cost, with the assumption that we get to retain a copy of the genomic and phenotypic data to feed into our vast knowledgebase, which we then integrate this data to generate insights and health intelligence for

our subscribed customers. Our capabilities range from state-of-the-art genomics data generation through the sequencing lab, to expertise in bioinformatics, algorithms development, machine-learning, and the launch of cloud based software platform solutions such as the HLI Knowledgebase™.

[related\_story]

Another competitive product offering we have is the Health Nucleus clinic based in La Jolla, California. It was established as a proof of concept on how to translate the vast amount of information into preventive healthcare. The goal is to use the omics information and apply it to individual health. These services are complemented by full body MRI scans, echocardiograms, as well as various other tests to be integrated to the genomic and phenotypic data of the individual. The idea is to gather all potentially influential variables for an individual's health and look at peaks of change at different modalities. An important discovery based on one year of the Health Nucleus operation, is that more than 30 percent of our "apparently healthy" customers had significant findings without any visible symptoms. Examples range from detection of early stage cancer, aneurysm or cardiovascular diseases that could immediately be addressed by a specialist. Early detection could save lives.

**Who are some of your key commercial life science partners and collaborators? How do you add value to their operations?**

We partner both with pharmaceutical companies and healthcare insurance companies. We have come public with our recent partnerships with Genentech, and AstraZeneca. For the latter, we have signed a 10-year agreement to sequence 500,000 genomic data from their clinical trials. More and more pharmaceutical companies are starting to see value in genomics in clinical trials, as it allows for patient stratification and understanding the distinctive responses from different patient types to different drugs, as well as different dosage of the same drugs. The most profound uses of our knowledgebase range from target discovery and in-silico validation, biomarker identification as well as patient stratification.

Moreover, another advantageous application of our knowledgebase for pharmaceutical companies is the opportunity to "rescue" failed clinical trials, which is where a significant risk lies for their business. Our approach is to investigate the genomic profiles of the patients that did respond to the trials and identify characteristics for which pharma can develop companion diagnostics and personalized medicine for a sub population of the original trial. Additionally, we aim to provide predictive pharmacogenomics models of which genomic profiles would be most responsive to

certain drugs, which add a substantial amount of value to pharmaceutical companies.

Our partnerships with health insurance companies is also an innovative model and it must be noted that the purpose of our data in this context is not to produce price discriminations. The idea is to provide comprehensive information for clients who are already insured and incentivize them to live healthier lives based on the needs and disease risk models presented by their genomic profiles.

In this regard, we have partnered with an insurance company in South Africa called Discovery Health, which already promotes healthy living in their business model for over 20 years, via their Vitality program. Their data have shown that clients with healthy active lifestyles live 6 years longer. In offering now the dimension of genetic analysis through our collaboration, there is a far greater insight to the health of the individual, and consequently potential of further extension of healthy living.

### **What is the rationale behind having a specific focus on aging and the therapeutic areas associated with it?**

The main causes of death across all categories in the global population are age-related diseases, namely, metabolic, cardiovascular, cancer, neuroscience and autoimmune diseases. In having a deeper and better understanding of genomic profiles, we can better promote healthy living, preventive care and early disease detection, and therefore minimize the onset of these diseases and extend lifespans. It also offers a wealth of insights for pharmaceutical companies to better develop personalized drugs with more targeted mechanisms in curing diseases. Studying different cohorts of centenarians and identical twins provides substantial data in how genetic and environmental factors interact and influence each other throughout the years, which can ultimately be translated into providing cautionary measures for patients.

“The main causes of death across all categories in the global population are age-related diseases, namely, metabolic, cardiovascular, cancer, neuroscience and autoimmune diseases.”

It was also imperative for us to look at the opposite spectrum of aging by studying newborns, which is done through our partnership with Celgene. One of our founders, Dr. Robert Hariri, is a neurosurgeon and an expert on stem cells who has established an FDA approved facility of placental stem cell biobanking, LifeBankUSA, which was initially acquired by Celgene and now is part of HLI. This collaboration aims to bring the dimension of genomics and tap into the potential of analytics to the vast amount of placental stem cell samples available to better understand their

development, as well as the paternal and maternal elements involved. This also serves as a sort of an insurance and preventive health platform for newborns and their adult life as it can help detect signs of rare diseases and potential onset of inherited and chronic diseases through looking at their genomics variants and generate their detail disease risk profiles.

**As an American company, Singapore is the only other global location you currently have outside of the US. What is the value proposition of Singapore and how do you leverage the Singaporean brand in your operations?**

As a start-up with our breadth of services aiming to reach global scale, genomics diversity of our knowledgebase is of utmost importance. Historically, clinical trial data in the pharmaceutical industry was mostly done on Caucasian populations in Europe and the US. Therefore, most of the drugs developed and the dosage recommendations are based on these populations. It has only been in the recent decades that emerging markets of Asia, Latin America, East Europe and Africa have gained importance in the pharmaceutical industry, but there is not adequate genomics and clinical knowledge on the suitability of these drugs and their optimal doses in these populations. Therefore we believe it is imperative to have a physical presence in different global markets, and to establish extensive collaborations with hospitals, research institutes, pharmaceutical companies and the health insurance industry in a fast growing and genomically diverse market such as Asia.

Moreover, Singapore was an ideal location, in particular, given the availability of global scientific and software engineering talent here and the developed technological infrastructure. Our company has grown to 300 people in its first two years of operation and attractive factors such as English as the formal language, government initiatives and affinity to technology and healthcare here facilitates our move for creating a global presence and an Asia hub at Singapore. The proximity to emerging markets also makes it an ideal location as a hub which is aligned to our focus on looking at a diverse range of disease profiles, as well as being conducive to the next frontier of our global growth. Singapore also has an attractive investor community and client base for potentially setting up the Health Nucleus clinic once the proof of concept is fully optimized in San Diego.

**What is the overarching vision for Human Longevity in the next three to five years?**

Our goal is to have 1 million sequenced genomes and integrated health records in 2020. Currently, we have sequenced more than 30 thousand whole genomes, which represents the largest such knowledgebase in the world. No other company or institution has this volume of data on a whole genome level, nor have them integrated it with phenotypic and medical information. The medical insights that have historically taken decades to generate will be accelerated at an exponential rate thanks to such initiatives, which will then translate to overall improvement of human health and

lifespan. We hope to permeate the concept of preventive health in systematic ways through adoption of our predictive models in hospitals, clinics and health insurance companies. There is profound economic value in reducing hospitalization and burden of care through early disease detection from genomic data. We hope to expand our global presence to every major city in the world in the long term, which will be done through step-by-step strategic expansions and communicating the immense value that the Human Longevity knowledgebase offers.

[See more interviews](#)