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2022 IATI Israel's Life Science Annual Industry Report

Connecting Israel's Tech Ecosystem

The Next Great Leap Forward in Health

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IATI is the umbrella organization of Israel's tech ecosystem with the mission of generating impact across all value chains of the Israeli economy and society

Connecting Israel's tech ecosystem

To learn more about joining IATI:

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Executive summary

IATI Israel's Life Science Annual Industry Report provides the broadest, deepest view of this thriving industry. The continuity, the annual comparison and the long-term view, all make the Report the most comprehensive take on the Israeli Life Science Industry. As the Israel's Umbrella Organization of the High-Tech & Life Science industries, IATI continuously acts to connect and promote the country's massive resources of academic and technological prowess towards creating a fertile ecosystem which will nourish growth in the coming years as well.

The Israeli life science industry kept growing in 2021 despite the COVID-19 pandemic. Continuance increase in the number of companies, stable maturity levels and innovation in new and developing sectors, all contribute to the industry's success and its significant role in the Israeli economy. 2021 was a record year in capital raising from VCs, public offerings and other investors with a challenging H1 of 2022 in these aspects.

After putting a spotlight on the industry's rising sub-sectors in our prior report, we focus this time on some new promising sub-sectors and following up on those we have identified in the past. This is in addition to the traditional sub-sectors discussed in our prior reports. The spotlight is put on those sectors not only because they are fast populated by new companies and attract more investments, but mainly as being leaders in innovation and multidisciplinary abilities, demonstrating the industry's ability to take advantage of the excellence in academic research, deep government support and the innovative ecosystem in Israel.

The healthtech industry has been experiencing dramatic changes due to the COVID-19 pandemic. From unique collaborations with players coming outside of the life sciences industry through fast paced adoption of digital health and remote health solutions, the pandemic had a huge impact on the industry. This also led to a record year when it comes to funding, as aforementioned.

The healthcare landscape is continuing to shift towards a more integrated ecosystem, converging biopharma, medtech, digital health and healthcare into a single bioconvergent industry. This emerging bio-convergent healthtech space holds great potential to make a transformative impact on health and healthcare practices. When it comes to holding a leading position in this emerging bio-convergent field, Israel has substantial strengths and capabilities. The new shifts and trends in the Israeli Health Tech space were all demonstrated for the first time in a conference driven by IATI by the industry and for the industry in continuation of the legacy of the MIXIII conference.

A broader discussion on Israel's value proposition in the bio-convergance sphere can be found in the "Bio-Convergence Revolution" chapter of this report.

The healthcare system is confronting skyrocketing costs, while the biopharma industry is coming up against aggressive pricing pressures. In an effort to meet these challenges, the healthtech industry is seeking new innovation growth engines.

Israeli life science companies can play, and in many ways already are playing, a leading role in facing the coming challenges. Fostering digital health innovation to address actual needs and not perceived ones, for example, can lead to significant improvements in integrating technological solutions, even from sources outside of traditional healthcare. We invite you to read insights from the field in the "How Can the Israeli Health-Tech Industry Reduce the Cost Burden" chapter and throughout the report.

We would like to warmly thank Omer Gavish, Partner, Pharmaceuticals & Life Sciences Leader at PwC Israel, for all the support in preparing this Report; Dr. Ami Appelbaum Chairman and Dror Bin, CEO of The Israeli Innovation Authority for supporting our Report and for partnering with us on promoting the industry throughout the year; Prof. Yossi Matias, Vice President, Engineering & Research, Google; Dr. Yair Schindel, Co-Founder & Managing Partner and the team of aMoon Fund; Oded Har-Even, Co-Managing Partner, Sullivan & Worcester Tel-Aviv; and Dr. Ruth Dagan, Partner, Head of Environment & Climate Change, Herzog Fox & Neeman.

Here's to another year of Israeli Health- Tech pride!

Karin Mayer Rubinstein

CEO & President

IATI

Yaacov Michlin

Chairman

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Looking Into The Future

In the sections above we provided you with an in-depth view of the Israel life sciences industry in the last year and decade - geographic location of the companies, leading sub-sectors, rising sectors, funding trends and the programs supported by the Israeli government. We would like to take the opportunity and share with you some forward looking discussions and ideas, suggest a fresh look new approaches, and what we think the coming trends are.

The Next Great Leap Forward in Health [49]

We are in the dawn of a new era in healthcare that is leading to revolutionary paradigm shifts. We envision a world where healthcare is no longer reactive, but predictive and preventative. Less generic, more personalized. Less episodic, and more continuous. From unsustainably costly hospital care to more accessible, equitable, home-based, and decentralized care.

Disruptive Innovation is the main driver fueling this paradigm shift at a speed and scale that is turning the $10 trillion healthcare industry on its head[50], and we believe these are the forces shaping the next great leap forward in health.

Multi-Omics: Genes are Only the Beginning

The multi-omics revolution is transforming the way we diagnose, treat and cure disease. Deciphering the human barcode at scale unlocks an unprecedented level of prevention, early detection, and personalized care. Today when we perform a screening or diagnostics test, like a mammography, colonoscopy, or a low dose lung CT scan to diagnose cancer, we are trying to find a lump or a mass which is cancerous. We are satisfied when we can discover this mass when it is still very small - This is considered early detection. However, in reality, it is much too late. Most illnesses begin to develop two, three, even four years before there is a lump, mass, or lesion. With multi-omics, we can diagnose or assign a cancer risk score based on molecular changes before there is a visible tumor: now *this* is early detection.

49 With the support of Yair Schindel, Co-Founder & Managing Partner of aMoon
50 The Economic Intelligence Unit, Data Tool accessed on 16 August 2018

To date, multi-omics approaches have been applied to determine the mechanisms of disease at the DNA (genomics), RNA (transcriptomics), Protein (proteomics), and Metabolites (metabolomics) levels. The vast quantities of rich data layers collected through analysis of lab samples have opened the door to identifying new and improved diagnostic and prognostic biomarkers, and ultimately generating a specific molecular signature of each human illness, for an early diagnosis and a more optimal treatment selection. The main barrier to wider adoption of these tools has traditionally been cost. For example, to produce a whole genome sequence and access someone's entire barcode used to cost millions of dollars. Eventually that price went down to tens of thousands. In the last couple of years, the cost has plummeted to a thousand dollars and even less, and these days Ultima Genomics is introducing for the $100 genome. This cost reduction is a game-changer. When prices drop so dramatically, it's much like Moore's Law and the price of computer chips, making available to the masses what was once accessible to a very small group of people. As genomics prices go down, we're beginning to run population studies on tens of thousands of people to augment at scale the clinical information needed to catapult predictive and precise insights.

The traditional method of trial and error upon which clinical practice relies today is starting to make way for a smarter, evidence-based, and more impactful method of care. Rather than playing a guessing game with people's lives, we will be able to know in advance whether a treatment will be right for them. It's only a matter of time before **true** early detection and informed choice of treatment become the universal standard of care.

Harnessing the power of biology: Working with the body rather than fighting it

So much of the way we treat disease today is by fighting *against* biological phenomena, when really, we need to be harnessing its power and complexity to fight disease *with* it. The treatment of cancer is a perfect example. Traditionally, doctors have worked to kill cancer either by cutting it out with surgery, eradicating it with chemotherapy, or destroying it with radiation. Yet in the process of trying to kill cancer cells in the body, we were sacrificing many healthy cells, and generating new clones of mutant cancer cells that returned with a vengeance.

Today we have changed this formula. Instead of fighting the body using relatively non-specific toxic agents, we are directing the body's own immune system to identify and kill it. Cancerous mutations occur naturally and randomly in our cells all the time. Under normal conditions, our immune system identifies these cells as different, and destroys them so they can't grow into a tumor. But as we age, or when we develop other medical conditions, our immune system cannot kill those cancerous mutations on its own. This is where immunotherapy, cell and gene therapy, and tissue therapeutics come into play to leverage the biological capabilities that are naturally found in our

bodies to heal.

Scientists have developed numerous techniques to preserve and augment the body to heal itself. One example is from a company called CartiHeal, in the field of OrthoBiologics. Cartiheal uses a unique mineral extracted from corals to treat degenerative cartilage defects in people's knees, specifically the disease of osteoarthritis. Say someone has osteoarthritis, instead of removing their knee and putting in a prosthesis (an invasive surgical procedure called Total Knee Replacement), doctors implant a coral aragonite scaffold, which the body dismantles, using the minerals to build brand new hyaline cartilage, as well as new subchondral bone underneath it.

Satellite Bio is another innovative example. They are implanting human liver cells to perform the function of an auxiliary liver, the same way a normal liver would. First, they build and grow a 3D organ in a lab, and then implant it into patients with severe liver disease. The small and flexible satellite implant goes under the abdominal muscles and secretes the liver enzymes the body needs.

Another way doctors are leveraging the body's inherent biological mechanisms is with CAR-T Cells, a procedure in which T cells (one of the immune system "killer" cells) are removed from the body, exposed to cancer cell, and are taught to attack it. The T cells are then multiplied and returned to the body, where they latch onto the cancer cells and destroy them. One example of innovation in this field is Adicet Bio, a cell therapy company, which helps T cells identify a tumor and kill it.

Now, instead of killing healthy cells with chemo and radiation, we are assisting the body to heal itself. When we can better enable our own immune system to police the body and remove the cancer and kill it, then we can eliminate cancer cells wherever they are in the body- including distant cancerous metastasis - without harming non-cancerous cells. That's a much more efficient way of treating cancer.

Data-fueled innovation: Unlocking big data, AI and machine learning to enable better care

Data is fueling innovation in healthcare by unlocking exponentially growing datasets to get ahead of disease. Unprecedent computational power, open-source algorithms and cloud resources coupled by the digitization of historical data and accumulation of new data streams have opened the door to rapid disruption in the healthcare space.

A key example is how google and deep mind revolutionized biology in 2021 by releasing al-phaFold as open source – a tool to visualize and study the potential structures of >200K proteins, that opened the door to structure-based design of new drugs.

This breakthrough proves the power of sharing and interconnecting data and the disruption to research and discovery processes that new technology can bring.

Although the availability and pooling of rich data sources to create data networks and make predictions is useful, it is not without its challenges and regulatory limitations. The sharing of patients' medical data comes with both technological complexities of data harmonization, as well as deep regulatory moats around privacy and safety of medical information. Some of the most exciting, and valuable technologies in the space today aim to solve these exact challenges.

A great example is MDClone's synthetic data platform, enabling the mass sharing of data between countries and medical centers without jeopardizing patient privacy, and without posing a cybersecurity risk. MDClone is building a global network where doctors and researchers in large hospitals around the world can share massive amounts of data, search it and discover new insights on better patient care and more efficient healthcare costs without sacrificing privacy.

The ability to share and integrate heterogenous health datasets has huge potential for faster learning and implementation of best practices across countries and between countries. Covid-19 accelerated that process. For example, MDClone, whose software is now used by every Israeli hospital and HMO, made it possible to quickly collect, analyze, and publish data from almost four million vaccinated patients very early in the pandemic. This data was the basis for several publications in the New England Journal of Medicine and in other high impact medical journals.

Al is also making an impact on how care is delivered. The growth of AI-powered care is also revolutionizing the way we treat patients. And in the words of Prof. Lloyd Minor, Dean of Stanford Medical School and venture advisor at aMoon: "AI is not going to replace doctors. Doctors who use AI will replace doctors who don't use AI. Machines will not replace people. But doctors who take advantage of machine learning and big data will be the doctors providing revolutionary care." Indeed, decision support tools and robotic interfaces are emerging as the new tools in the doctor's medical bag.

This paradigm shift toward data-driven care is powered by hyper-efficient hardware with unprecedented processing power and constantly evolving software solutions, areas in which Israel has been punching above its weight for the last three or four decades. Israel has always been very strong in the field of Hi-Tech. Now that healthcare and biology are converging with technology, many leading tech entrepreneurs and investors are crossing their disciplinary boundaries, hoping to make a difference in healthcare and life sciences. That wasn't the case just ten years ago. Yet they have come to realize this unique opportunity to make a positive impact on people's lives. Not just to do well, but to do good. This is why we are seeing so many brilliant minds transition from Hi-Tech to HealthTech.

Another factor is that HealthTech no longer has geographical or thematic boundaries. Science used to be siloed, with slow and inefficient exchange between different countries and different industry verticals. Today HealthTech is crossing borders and disciplines. Establishing and expanding these bridges is the best strategy for Israeli HealthTech to rapidly grow. The more we enable talent, capital, technology, data sharing and insights to flow freely between global HealthTech hubs, the faster we can get ahead of disease and accelerate cure.

It will take a bit more time and more funding for these innovations to become the norm. Yet we are already seeing the early signs of a massive revolution in the $10 trillion industry of HealthTech. For some of these advancements, such as true early detection and choice of treatment via Multi-Omics biomarkers, or big data and artificial intelligence in radiology, pathology and other specialties, we'll start to see these become more prevalent in three to five years, and then in ten years they will be widespread.

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