



Modern  
Agriculture  
Foundation



# Alternative Proteins | IL 2021

## Israeli Landscape Mapping

June 2021

Max and Bella Stein  
Charitable Trust



Reinhold  
Cohn



## חברים ושותפים יקרים,

בעשור האחרון אנחנו עדים למגמה גלובלית ההולכת ומתחזקת בתחום הפודטק ובתוך כך תחום החלבון האלטרנטיבי, כאשר חברות מזון גדולות ותאגידים, מבינים לאן נושבת הרוח ונראה כי כולם עמלים על פיתוח אסטרטגיית חלבונים אלטרנטיביים כמנוע צמיחה עתיד. השוק מוצף במוצרים חדשים שמבוססים על חלבונים מהצומח וקשה להתעלם מהשפע והמגוון.

מדינת ישראל נמצאת בקדמת הבמה ומובילה בהשקעות ופיתוח בתחום זה. ההשקעות בחברות שמפתחות חלבון אלטרנטיבי כתחליף לבשר ולחלב גדלו בישראל פי 8 בשנתיים האחרונות, והצפי הוא שעד 2030 יהוו התחליפים 10% משוק החלבון העולמי.

כידוע, אחוז גבוה מאוד מהמחלות והמגיפות החדשות מקורן במזון מהחי וכך גם העמידות לאנטיביוטיקה שיוצרת איום חדש על בריאות העולם, מה שעלול לגבות בעתיד אין ספור קורבנות. הפחתת צריכת המזון מהחי תשפיע משמעותית על איכות הסביבה ותפחית את הנזקים חסרי התקדים שהתעשייה הזאת מייצרת: זיהום אוויר, בזבז מים ואנרגיה, בירוא יערות, התחממות גלובלית, מחלות זואוונטיות וביטחון תזונתי. לכך יש להוסיף גם את הפחתת הפגיעה בבעלי חיים הנובעים מתעשיית המזון מהחי.

כל זה מתעצם נוכח ההעובדה שאוכלוסיית העולם נמצאת בעלייה מתמדת לצד שיפור תוחלת החיים, כך שיהיה מאתגר ביותר להאכיל מיליארדים רבים של בני אדם בהתבסס על התעשייה מהחי הקיימת. באמצעות חדשנות בעולם המזון, עם דגש על פיתוח חלבון אלטרנטיבי, נוכל למצוא מקורות חדשים להאכלת אוכלוסיית העולם בצורה בת-קיימא באופן שתקטין את הפגיעה בכדור הארץ ותמנע הידלדלות משאביו הטבעיים.

בזכות הטכנולוגיות החדשות, לראשונה בהיסטוריה, אנחנו יכולים לשלוט במדויק על תהליך יצור המזון ללא תלות בחקלאות תעשייתית של בעלי חיים.

התהליך ההיסטורי הזה מתאפשר הודות לפריצות דרך בשלוש טכנולוגיות עיקריות: הראשונה - בשר מתורבת - בשר אמיתי לחלוטין, שלא נדרשה חיה כדי לייצרו, השנייה - הפקת חלבונים מהצומח - חיקוי של המזון מהחי באמצעות חלבונים מהצומח, והשיטה השלישית - פרמנטציה (תסיסה) - ייצור חומרי גלם שהיו קיימים עד היום רק בעולם החי.

אנו, בעמותה לחקלאות מודרנית פועלים ללא מטרות רווח לקידום תחום זה מתוך אמונה כי ניתן לפתח ולייצר מוצרי חלבון חלופי, כגון בשר וחלב, אשר החך האנושי הורגל לטעמם במשך אלפי שנים, בדרך יותר יעילה אנרגטית ובעלת טביעת אצבע סביבתית פחותה משמעותית.

יחד עם שותפינו הרבים מתעשיית המזון הקיימת והחדשנית, אנו מאמינים כי ניתן לייצר מציאות חדשה וחלופית תוך מספר שנים. שיתוף פעולה בין תעשיות כגון תעשיית המזון, הביוטכנולוגיה, חומרי הגלם ותעשיות נוספות, תאפשר אקסלרציה ואופטימיזציה של מציאות החלבון האלטרנטיבי החדשה.

התנופה חסרת התקדים של תעשיית הפודטק בכלל והחלבון האלטרנטיבי בפרט לא מותרה מקום לספק שהשנים הבאות יתאפיינו בשגשוג האקוסיסטם, תוך הקמת חברות נוספות רבות במקביל לתהליכי ייצור תעשייתיים ובניית מפעלים חדשים לחברות הקיימות. למרות האתגרים הטכנולוגיים הקיימים בדרך להנגשת מוצרים אלו לכלל האוכלוסייה, אין לי ספק כי יחדיו נצליח להגיע להישגים משמעותיים.

אישית, אני מאמינה בזיהוי הפוטנציאל הטמון בקדמה וההתפתחויות הטכנולוגיות שמאפשרות התנהלות סביבתית נאותה ומזעור פגיעה בכדור הארץ. אני סבורה שהשנים הבאות יתאפיינו בהקמת חברות נוספות במקביל לתהליכי ייצור תעשייתיים ובניית מפעלים חדשים לחברות הקיימות. אנחנו כאן כדי לחולל שינוי, להשפיע ולהנחיל דרך חיים לא פוגענית, בריאה ואקולוגית שתיראה טבעית בעידן החדש בפתחו אנו נמצאים.

בחברת מיפוי זו ריכזנו מידע רב ויסודי על החברות הקיימות בשוק החלבון האלטרנטיבי, על-מנת שתהווה פלטפורמה שימושית לכל הגורמים הרלוונטיים בתחום ותאפשר מינוף ויצירת קשרי פיתוח וייצור בתוך תעשיית החלבון האלטרנטיבי, ובכך תאיץ את קידום התחום, למען עולם טוב יותר.

ברצוני להודות לנטע רוזנטל, מנהלת התפעול של העמותה, על השקעה של לילות כימים בריכוז, איסוף ועריכה של החומרים המוגשים לכם בחוברת המיפוי. תודה רבה למעצבת הגרפית יעלי יקיר על עיצוב ועריכה במקצועיות ובסבלנות אינסופית.

כמו כן, ברצוני להביע את הערכתי הרבה לצוות GFI ישראל על תרומתם האדירה לקידום התחום בארץ, וכמובן תודה גם לספונסורים והתורמים שאפשרו יצירת מיפוי זה.

ואסיים בציטוט של ויקטור הוגו, כי באמת "אין דבר רב עוצמה יותר מרעיון שהגיע זמנו".

בהצלחה לכולנו,  
לבנה שיפמן, מנכ"לית  
העמותה לחקלאות מודרנית



Modern  
Agriculture  
Foundation

## Dear friends and partners,

Over the past decade, we have witnessed a growing global trend in the field of foodtech, especially in the alternative protein sector, with large food companies and corporations understanding the shifting tides. Everyone seems to be working on developing an alternative protein strategy as a future growth engine. The market is flooded with new products based on plant proteins and it is hard to ignore the abundant and diverse products.

The State of Israel is at the forefront of investment and development in this field. Investments in companies that develop meat and dairy alternatives have grown eight-fold in the last two years. By 2030 these alternative proteins are expected to be 10% of the worldwide protein market.

As is well known, a very high percentage of new diseases and pandemics come from animal-derived food, as well as the resistance to antibiotics that poses a new threat to the world's health, which may claim countless victims in the future. Reducing our consumption of animal-based products will benefit the environment, improve food security, and reduce the unprecedented damage this industry causes: air and water pollution, water and energy waste, deforestation, global warming, zoonotic diseases, and will also reduce the harm caused to animals.

All of this is intensified by the fact that the world's population is constantly on the rise, alongside improving life expectancy, so it will be extremely challenging to feed many billions of people based on the existing animal food industry. By way of technological innovation in the food sector, particularly in the field of alternative proteins, we can find new and sustainable food sources that will substantially decrease our negative impact on the environment and make our natural resources last longer.

Thanks to the new technologies, for the first time in history, we can precisely control the process of food production with no dependence on industrial animal agriculture.

This historical process is made possible thanks to breakthroughs in three main technologies: the first - cultured meat - completely real meat, which did not require an animal to produce. The second - plant-based proteins - the production of alternatives to animal-based food, imitating its texture and taste, using plant proteins, and the third method - fermentation - the production of raw materials that to this day existed only in the animal world.

We at the Modern Agriculture Foundation, as a nonprofit organization, support this field in belief that meat and dairy, which the human palate has been accustomed to for thousands of years, can be developed and produced in a more energy-efficient way, and with a significantly smaller environmental footprint.

Together with our many partners from the traditional and innovative food industries, we believe that a new and alternative reality can be created within a few years. Cooperation between industries such as the food industry, biotechnology, raw materials and other industries will enable the excellence and optimization of the new alternative protein reality.

The unprecedented momentum of the foodtech industry in general, and particularly of alternative proteins, leaves no room for doubt that the coming years will be characterized by the prosperity of this ecosystem. Despite the technological challenges that exist on the way to making these products accessible to the general population, I have no doubt that together we will have significant achievements.

Personally, I believe the potential of progress lies within technological developments that will treat the environment kindlier and will minimize harm to the planet. I speculate that the coming years will be characterized by the establishment of new companies, and new industrial manufacturing facilities, as well as the construction of new factories for existing companies. We are here to make a difference, influence and instill an un-destructive, healthy, and ecological way of life that will seem natural in our new era.

In this mapping booklet, we have compiled a lot of thorough information about the companies that exist in the alternative protein market, to provide a useful platform for all relevant entities in the field and enable the creation of development and production relationships within the alternative protein industry, thereby accelerating the advancement of the field, for a better world.

I would like to thank Neta Rosenthal, the organization's Operations Manager, for spending days and nights concentrating, collecting, and editing the materials submitted to you in the mapping booklet. Thank you very much to the graphic designer Yaely Yakir for designing and editing with endless professionalism and patience.

I would also like to express my great appreciation to the GFI Israel team for their tremendous contribution to the advancement of the field in Israel, and of course thanks to the sponsors and donors who enabled the creation of this mapping.

I will end with a quote from Victor Hugo, because really, **"There's nothing more powerful than an idea whose time has come."**

Good luck to all of us.

**Levana Shifman, Executive Director**  
**Modern Agriculture Foundation**



**Dear friends,**

In the past few years, we have observed a growth in the use of alternative proteins, thereby contributing to our ability to ensure global food security and meet the needs of 9 billion people by the year 2050, while conserving natural resources and ensuring sustainability.

InNegev is a technology incubator located in the Negev. Its partners include Israeli industrial companies Netafim, SodaStream, Dolav as well as investors Kibbutz Hatzerim, Alpha Capital, all active in the FoodTech sector. InNegev partners provide their portfolio companies with funding, research and development support, guidance and more.

We recognize the tremendous financial, social, and economic impact of this sector, and we are working to advance and develop startups in the field by providing funding and strategic partnerships that help advance economic development in the Negev region and throughout Israel, and investing in 1 - 2 early stage startups every year in this field.

We are excited to be part of the community promoting alternative protein technology in Israel and worldwide.

Sincerely,

**Amir Tzach**

**VP Business Development**

**InNegev**



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## SCALE-UP CHALLENGES FROM LAB TO INDUSTRIAL PLANT



“The development of food products from laboratory scale to industrial production involves numerous planning steps. Experience has shown that the risk of planning errors is high – and that these can cause enormous and unforeseeable costs in the run-up to product launch.

Leading up to the market launch of foods produced by biotechnological methods there is an extensive and complex development process. ZETA's cross-functional engineering team draws on expert knowledge from a range of fields and, together with our customers, devises tailor-made and highly sustainable solutions.

We know from experience that the early involvement of our process engineers in the upscaling process is real added value for any project. The early identification of potential risks minimizes unnecessary costs in the realization phase. This is why we conduct an in-depth analysis of processes at the lab stage with production at an industrial scale in mind, and take this as the basis for the pilot plant.”

### **Claudia NEUHOLD**

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[zeta.com/fermentation](http://zeta.com/fermentation)



**LEARN MORE**  
[zeta.com/fermentation](http://zeta.com/fermentation)

### **Benefits for our customers**

- Comprehensive upscaling expertise
- Experienced cross-functional team
- Approved tools for bioreactor characterization

# OPTIMIZED BIOREACTORS AND PROCESS CHARACTERIZATION



## SPECIAL FOCUS ON THE GAS TRANSFER RATE

Bioreactors are expected to provide optimal conditions for growth and product formation of cells in culture with the aim of maximizing biomass and product yield. The design of the bioreactor for the optimal process, however, can be a great challenge for engineers due to complex interactions of multiple process parameters and cultivation conditions.

In accordance with different regulatory guidelines and  $Q_bD$  principles ZETA focuses on new methods for an in-depth process understanding.

### Meeting the cell line specific oxygen utilization rate:

the  $k_La$  value can be influenced by reactor design, mixing speed, gassing rate, temperature, and properties of the cell culture medium. Additionally, high amount of dissolved Carbon dioxide (CO<sub>2</sub>) can affect general cell health. To decrease the CO<sub>2</sub> concentrations in the culture medium a combination of stirring, sparging and surface aeration in the bioreactor is used.



**Thomas Maischberger**,  
Process Engineer  
and  $k_La$  Specialist at  
ZETA states:

“A crucial parameter for production of sufficient biomass levels is oxygen. Therefore, the **transfer of oxygen from gas to the liquid phase** is a limiting step in the bioreactor system and is expressed by the  $k_La$  value. Turning the right engineering screws within your bioreactor system will **improve the oxygen transfer rate (OTR)** which enables the cells to take up oxygen efficiently and keeps them alive and productive. This is true for classical

stirred tank reactors, but also for other types of bioreactors operated in suspension mode. For scaffold-based perfusion-like fermentations, the cells requirements stay the same – from the Bioengineering perspective the process becomes even more interesting and challenging.

With my team we have developed a **new method to measure the  $k_La$  value** for a better understanding of the "black box system" bioreactor. Every parameter you can measure inside a bioreactor is an advantage. Knowing the specific performance indicators of the bioreactor system allows a **target oriented scale-up** of the lab or pilot system. ZETA's CFD simulation is able to support the engineering work around scaling and retrofitting of bioreactor systems keeping in mind that only experimentally validated models can **create added values** and additional benefits.”

### Key value of $k_La$ optimization

- higher biomass
- higher product yield
- better product quality
- higher process stability
- optimized processing time
- lower shear stress

### Why determining gas transfer rates?

- ensure adequate supply of oxygen
- ensure adequate CO<sub>2</sub> stripping
- optimize control variables
- for a better process understanding
- optimize scale-up and scale-down models
- for an improved bioreactor design



### ZETA project experience in

- Parameter Optimization
- Design optimization & Retrofitting
- Scale down for Pilot & Lab Scale
- Scale up for large commercial scale
- Bioreactor characterization by  $Q_bD$  approach

### For further information in bioreactor and process design please contact:

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## Alternative Protein

**A Rising Category within the Foodtech Sector\***

### Introduction

Indicators in the world and in Israel are pointing to the fact that Foodtech will be amongst the great industries of the coming decade. Within the Foodtech sector, one of the most interesting and exciting categories is Alternative Proteins. Most of the companies in Alternative Proteins have emerged in the last decade.

Major changes in the way we consume foods in the coming decade is powered by three separate changes that overlap and fuel each other.

Animal Farming almost reached the limits in terms of scale, reach, and efficiency. Modern alternatives will be up to 100 times more land efficient, 10-25 times more feedstock efficient, 20 more time efficient. They will also produce an order of magnitude of reduced waste and less environmental destruction. With the projected rise in meat consumption due to China and India's growth, problems will undoubtedly arise in supplying this demand for meat, poultry, eggs, and dairy.

Second is the growing health awareness, becoming more of an issue with more and more young adults, that are moving towards a more plant-based, alternative protein rich diet. Almost 50% of Gen Z, Millennials, and Gen X have reported that they have consumed plant-based meat or meat made from plants once a week or more often.

Third is the result of the advancing technology in Precision Biology, Synthetic & Systems Biology, AI, ML, Chemical Synthesis, Genetic Engineering, Precision Fermentation. All these have enabled considerable strides to create a new variety of more nutritious, healthy, superior, and eventually cheaper food products.

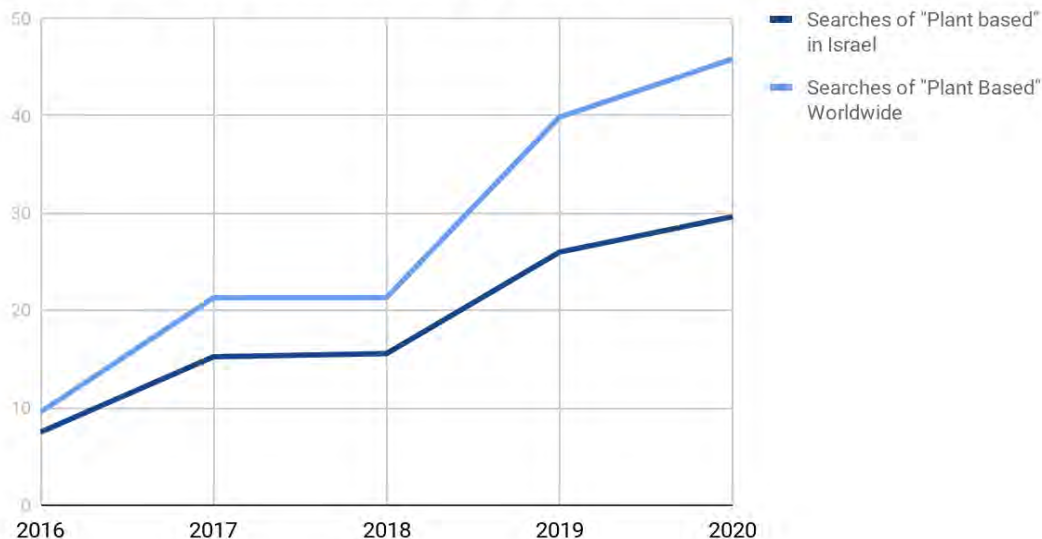
Alternative Protein can be divided into three major categories: Cultured Meat, Fermentation, and Plant-Based Foods. Modern Agriculture Foundation (MAF) has reported approximately 40 publicly active companies in Israel, without counting other companies at different stealth R&D stages that will surface soon.

The Israeli Alternative Protein industry is gaining momentum. In the last years, the number of companies in this field has increased dramatically. The COVID-19 pandemic, which likely came from the wildlife food industry in China, has increased public interest in Alternative Proteins in general and in plant-based alternatives specifically. <sup>1</sup>

1 According to Google Trends.



## Interest in "Plant Based"; Israel vs World



The COVID-19 crisis has highlighted to many stakeholders and companies that animal proteins and their production can bring significant dangers. It has intensified the need for alternative proteins which are at the center of Foodtech innovation. Yet, there are other possible issues with large scale livestock farming.

Livestock is one of the top three most significant contributors to severe environmental problems. According to one study, the animal food industry is responsible for 14% -18% of greenhouse gas emissions in the world,<sup>2</sup> more than the emissions of the entire global transportation industry. Another study concluded that the animal food industry was responsible for at least 51% of worldwide greenhouse gas emissions.<sup>3</sup> The difference between the studies is that the second study includes livestock respiration and weighs the three major greenhouse gases: carbon dioxide, methane, and nitrous oxide, by their global warming impact over 20 years (as opposed to over 100 years in the first study). In 30 years, the world population will reach 10 billion,<sup>4</sup> and we will have to find a practical, sustainable, healthy, and environmentally friendly way to feed such a large amount of people.

With any crisis comes the opportunity, and the State of Israel, which is known for its innovation and entrepreneurship, can produce food solutions to face the global crises. Over the decades, Israel has become a powerhouse of innovation - entrepreneurs in Israel succeeded in transferring technologies from academia to commercial applications, and Israel attracted investments from the largest companies and VCs in the world. Since Israeli companies has also been innovative in the space of agriculture and irrigation for years, there is no reason why it should not take its technological, agricultural, and scientific capabilities

2 UN Report: Livestock's Long Shadow, 2006.

3 Goodland, R. & Anhang, J. (2009). Livestock and Climate Change.

4 UN, World Population Prospects, 2019.

and integrate them and become a world leader in Alternative Protein as well. Alongside the establishment of large technology companies in the high-tech sector, this same technology prowess should lead to the development of leading companies in the field of Foodtech in the coming years, through private and public investment.

In September 2020, a survey<sup>5</sup> showed that 9% of the population in Israel are vegan/vegetarian and an additional 8% are looking to reduce the consumption of animal-based protein. In addition, a supermarket retailer chain in Israel, has shared that the income in Q3 2020 from plant-based burgers is 44% of the total burger sales income.

The Alternative Protein sector in Israel is a rapidly developing young ecosystem, with a vigorous entrepreneurial activity that is based on solid scientific and technological foundations. As of today, there are over 100 companies<sup>6</sup> which have developed or are in the process of developing Alternative Protein solutions in Israel. Five of them are developing cultured meat and milk, a number that is higher than any other country except the United States, which makes Israel a world leader in the most ambitious field of the Alternative Protein industry.

## The leading trends in the Alternative Protein sector are:

- Cultivated Meat: Meat made out of cells without the need of raising an animal.
- Fermentation: Products made using microorganisms in one of three types of production: traditional, biomass and precision fermentation.
- Plant-based: Companies which are developing new plant-based alternatives to meat, dairy and eggs, using either innovative or existing technologies.
- Novel Ingredients: New proteins and other ingredients as a new resource for the industry.

The majority of startup companies in the sectors of Cultivated Meat, Fermentation, Plant-Based Meat, Dairy & Eggs and Novel Ingredients, have been founded during the last three years.

## Investments and funding\*

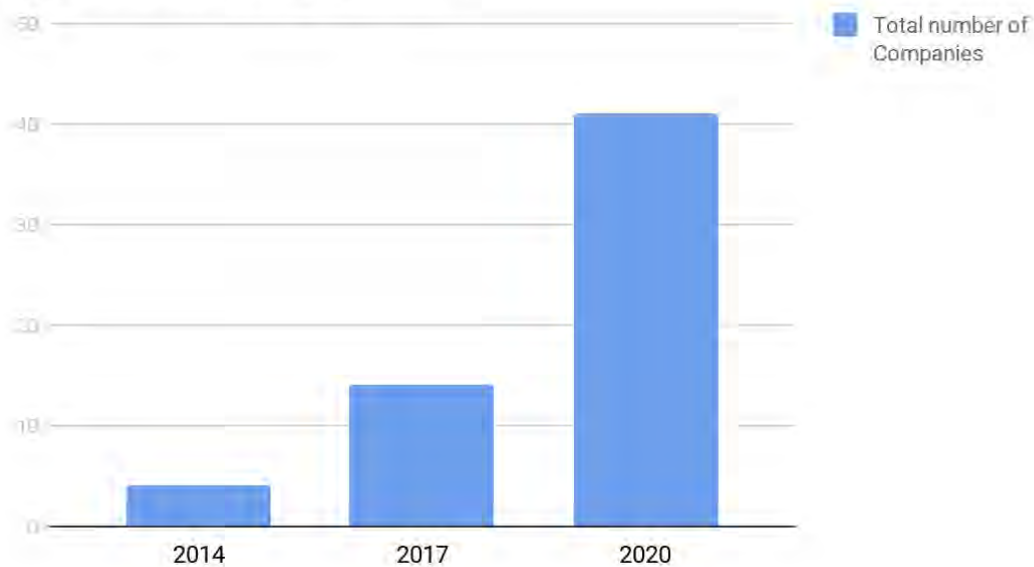
The overall investments in the Alternative Protein sector in Israel so far is estimated to be \$183 million in various rounds.

New solutions in the field of Alternative Protein contributed to the increase in the number of Foodtech oriented investors. Up until 2019, most of the funds went towards harvest solutions.

5 An internal survey done by Rushinek for Vegan-Friendly (R.A) in Sep, 2020.

6 The Modern Agriculture Foundation's 2020 report.

## Number of companies in Cell-based Meat, Novel Meat, Novel Dairy & Eggs and Novel Ingredients.



Still, in the last two years, start-ups in the field of Alternative Protein came to the forefront and have taken no less than 34% of investments in agriculture and food technologies together. In 2020, despite COVID-19, 12 companies received seed investments, and 13 companies have been invested in follow-up rounds.

Investment transactions since the first half of 2019 have become smaller in the number of investments, but more extensive in the amount of money invested. Until 2018, the median investment was about \$1.5 million, and since then, the investments have increased significantly. While 2020 had no large transactions of that scale, the positive trend continues to be maintained overall.

New investors from Israel and around the world join the Alternative Protein field every year. The percentage of foreign investors from transactions in Israel has increased significantly in the last two years. In 2014, foreign investors accounted for only 38% of transactions, and in 2020, it is already over 50%. Foreign investors in the field include international venture capital funds like S2G and giant companies like Tyson Foods.

The Alternative Protein sector, as a part of the Foodtech industry, also receives local support. The State of Israel sees the sector as an opportunity for growth. The 'Israel Innovation Authority' transfers up to \$35 million annually in grants to start-ups in that sector. In addition, a large food incubator began operating at Kiryat Shmona, where several start-ups are already running. During 2021, the Israel Innovation Authority will financially assist in establishing a 'Food Institute' at Tel-Hai College that will provide services and

innovation to food companies and start-ups. As of today, ten Foodtech related incubators and accelerators<sup>7</sup> are operating in Israel.

**Israeli AgriFood-tech Equity Investments**



**Median and Largest Deals**



## 2020 - The IPO year

In October 2019, for the first time, a cell-based meat company (MeaTech) merged with a public company to run for an IPO in the Tel Aviv Stock Exchange. Few months after the merge, in June 2020, the company raised additional funding from Rami Levi and Adom-Adom Group. In December 2020, a Novel Meat company (SavorEat) IPOed with a value of NIS 380M.

The Alternative Protein companies are not alone. In July, a new Israeli Alternative Protein VC "Millenium FoodTech" applied for an IPO to back Alternative Protein companies. The company raised \$8M, and applied for an additional \$5M. Wilifood, one of the largest Israeli food companies, is opening a new Alternative Protein VC and preparing to go with the new VC for an IPO as well.

In March 2021, R&D Partnership Bio Meat Foodtech filed for an IPO in the Tel Aviv Stock Exchange, and in April 2021, BioMilk also IPOed in the Tel Aviv Stock Exchange, and became the first Cultured Milk company in the world to go public.

## Outstanding Investment Deals in Alternative Protein during 2019-2021<sup>8</sup>

**Redefine Meat**, developing a multidimensional plant-based meat printing technology, raised \$29M in the largest series A round for an Israeli company in the plant-based meat space.

**Innovopro**, has developed a technology designed to extract a 70-percent-chickpea protein concentrate, and has raised \$15M in a Series B round.

<sup>7</sup> Start-up Nation Central, AgriFoodTech 2020 Report

<sup>8</sup> Source: CrunchBase.com

**Future Meat**, a Cell-based Meat company focusing on animal-fat development, has raised \$14M in Series A round in 2019, and an additional Series B round of \$26.75M in 2021.

**Hinoman**, develops and cultivates Mankai, a protein-rich vegetable grown using sustainable hydroponics, has raised \$15M in a series B round.

**Aleph Farms**, a food-tech startup that grows meat cuts from beef cells using a 3D tissue engineering platform, has raised \$12M in a Series A round.

**Equinom**, a seed breeding company that uses DNA sequencing and proprietary algorithms to make the breeding process more efficient, has raised \$10M in Series B round.

**Else Nutrition**, focused on developing plant-based food and nutrition products, raised \$30.9M in post-IPO investment rounds throughout 2019-2021.

## Conclusion

2020 is the year that Alternative Protein reached new global heights. With new IPOs and investments from non-Foodtech related VCs, we can agree that Alternative Protein is no longer a niche. Israel is looking to continue to invest into more innovative ideas to become the leader in innovation within this space. Amidst the global pandemic and environmental crisis, there is newfound interest in feeding the world in a way that is sustainable and healthy. Israel, the nation of “milk and honey,” may soon become the nation of “cultured meat and clean milk,” changing the way we consume our food and ultimately serving as a catalyst for a brighter, better tomorrow.

\* All the information in this article was gathered between November 2020 and April 2021. The information in this article has been compiled with the utmost care and efforts have been made to ensure its accuracy, yet there may be omissions or inaccuracies.

## CULTIVATED

### Aleph Farms (2017)

Rehovot, Israel

Creating cultured whole-muscle beef using 3D scaffolding and multiple cell types, GMO & Antibiotics Free

Founded by **Didier Toubia** and **Prof. Shulamit Levenberg**

[www.aleph-farms.com](http://www.aleph-farms.com)



### SuperMeat (2015)

Rehovot, Israel

Creating cultured chicken meat, collaborating with production experts from the pharmaceutical industry to create non-GMO cultured chicken

Founded by **Shir Friedman, Koby Barak,** and **Ido Savir**

[www.supermeat.com](http://www.supermeat.com)



### Future Meat Technologies (2018)

Rehovot, Israel

Produces non-GMO lamb, chicken and beef fat and muscle cells.

Founded by **Prof. Yaakov Nahmias**

[www.future-meat.com](http://www.future-meat.com)



### BioMilk (2018)

Rehovot, Israel

Developing laboratory-cultured milk.

Founded by **Dr. Nurit Argov-Argaman** and **Prof. Maggie Levy**

[www.biomilk.com](http://www.biomilk.com)



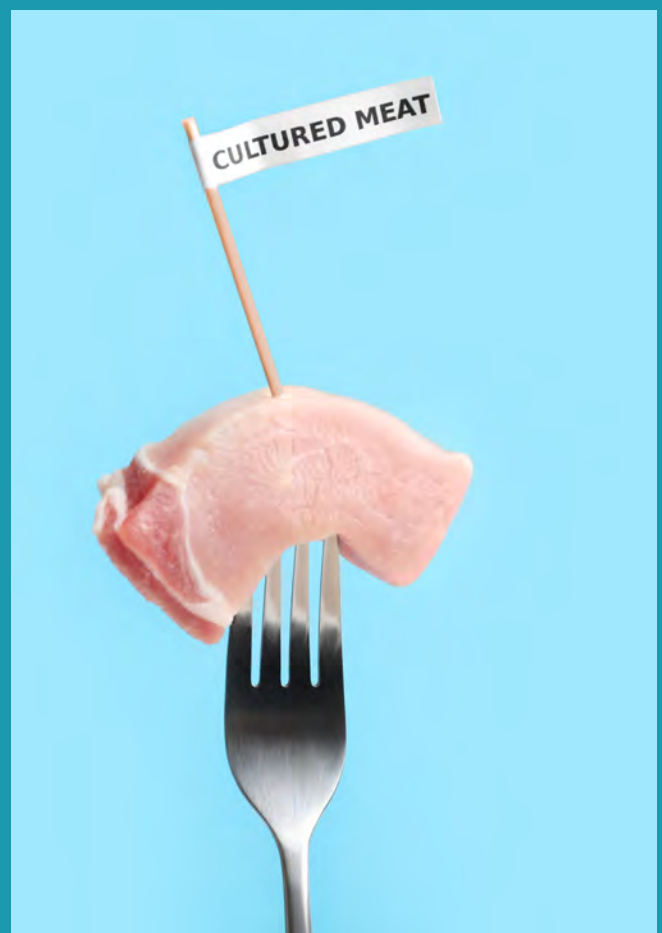
### MeaTech (2018)

Ness Ziona, Israel

Creating cultured beef, 3D printed from animal-derived stem cell ink

Founded by **Sharon Fima,** **Amir Hasidim,** and **Dr. Omri Lubovsky**

[www.meatech3d.com](http://www.meatech3d.com)



# FERMENTATION

## NextFerm (2013)

Yoqneam Illit, Israel

Developing and producing novel, active ingredients for the food industry, using fermentation-based technologies.

Founded by **Boaz Noy**, Co-founder & CEO; **Tzafra Cohen**, Co-founder, SVP R&D & BD

[www.nextferm.com](http://www.nextferm.com)



## Kinoko Tech (2019)

Rehovot, Israel

Mycelium-based product grown on legumes & grains using biomass fermentation, creating a protein-rich product with tempeh-like texture

Founded by **Jasmin Ravid**, **Daria Feldman**, and **Hadar Shohat**

[www.kinoko-tech.com](http://www.kinoko-tech.com)



## More Foods (2019)

Tel Aviv, Israel

Fermentation-produced product based on an all-natural blend of secret ingredients - flagship product contains approximately 24% protein

Founded by **Leonardo Marcovitz**

[www.more-foods.co](http://www.more-foods.co)



## Chunk Foods (2020)

Tel Aviv, Israel

Food-Biotech startup developing a novel technology that combines plant-based ingredients and fermentation to create whole muscle cut meat analogs.

Founded by **Amos Golan**

[www.chunkfoods.com](http://www.chunkfoods.com)



## Remilk (2019)

Ness Ziona, Israel

Uses microbes to produce the key ingredients in milk, developing technology for creating a milk substitute that is similar to cow milk in flavor, nutritional composition and functionality

Founded by **Ori Cohavi**, and **Aviv Wolff**

[www.re-milk.com](http://www.re-milk.com)



## Brevel (2016)

Shekef, Israel

By providing truly affordable, consistent and scalable production of microalgae based products Brevel is paving the way for a future where microalgae are a natural part of our life. Brevel's breakthrough technology unlocks the true potential of microalgae as the ultimate source of sustainable bio-based ingredients, providing for the first time a viable solution for a wide range of industries.

Founded by **Yonatan Golan**, CEO; **Ido Golan**, CTO; **Avi Tal**, VP BD

[www.brevel.co.il](http://www.brevel.co.il)



## Fantastic Farms (2019)

Tel Aviv, Israel

Focused on creating animal-free dairy and eggs in a novel way

Founded by **Aviel Even**, **Igor Magazinik**, and **Dan Even**

[www.fantasticfarms.com](http://www.fantasticfarms.com)



## Imagindairy (2020)

Ashdod, Israel

Develops milk proteins with AI platform and precision fermentation

Founded by **Eyal Afergan** and **Prof. Tamir Tuller**

[www.imagindairy.com](http://www.imagindairy.com)



## Yeap! (2020)

Ashdod, Israel

Single-cell proteins processing from yeast to mimic meat and dairy

Founded by **Didier Toubia**, **Dominik Grabinski** & **Jonathan Goshen**

[www.yeap-proteins.com](http://www.yeap-proteins.com)



## Mediterranean Food Lab (2019)

Tel Aviv, Israel

Using novel methods inspired by traditional fermentation technologies to produce plant-based products and improve the sensory qualities of a wide range of plant-based meat and other foods

Founded by **B.Z. Goldberg**, CEO and Director of R&D

[www.med-food-lab.com](http://www.med-food-lab.com)



## PLANT BASED

### BioFood Systems (2018)

Hod Hasharon, Israel

Technology, Plant-based meat analogues

Founded by **Yohai Ben Zikri** and **Arturo Geifman**

[www.biofood-systems.com](http://www.biofood-systems.com)



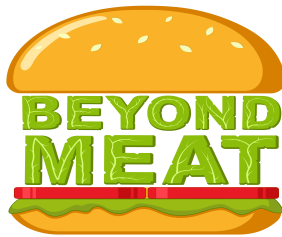
### Wonders of Nature (2020)

Shlomi, Israel

Develops a variety of plant-based meat alternative products, sold nation-wide

Founded by **Ronit Davidovitch**

<https://wondermeat.com/>



### Yofix (2014)

Ashdod, Israel

Develops and manufactures clean-label vegan and soy-free fermented plant-based prebiotic and probiotic foods, based on a blend of cereals, nuts, and seeds

Founded by **Ronen Lavee**, **Shlomi Alfa**, and **Oded Ilan**

[www.yofix.co.il](http://www.yofix.co.il)



### Redefine Meat (2018)

Tel Aviv, Israel

Multidimensional plant-based meat printing technology, combining proprietary 3D meat modeling, food formulations and food printing technology

Founded by **Eshchar Ben-Shitrit** and **Adam Lahav**

[www.redefinemeat.com](http://www.redefinemeat.com)



### Planterra (2019)

Savyon, Israel

Early-stage alternative dairy company, developed a range of chickpea-based, clean-label products, including milk, creamer, yogurt, cream cheese, and pudding.

Founded by **Noam Sharon** and **Noam Dekkers**

<https://www.planterralab.com>



### Rilbite (2017)

Ashdod, Israel

Maker of a plant-based burger seeking biomimicry

Founded by **Barak Melamed**, **Itai Farkas**, and **Shlomi Goren**

[www.rilbite.com](http://www.rilbite.com)



### Zero Egg (2018)

Kfar Saba, Israel

Creates two plant-based egg formulas, available to Foodservice Operators and Food Manufacturers in the US, Europe, and Israel

Founded by **Liron Nimrody**

[www.zeroeggfood.com](http://www.zeroeggfood.com)



### SavorEat (2018)

Rehovot, Israel

Developing a 3D print & cook customizable method to create plant-based meat substitutes

Founded by **Racheli Vizman**, **Prof. Oded Shoseyov**, and **Prof. Ido Braslevsky**

[www.savor-eat.com](http://www.savor-eat.com)



### Equinom (2012)

Givat Brenner, Israel

Uses DNA sequencing and proprietary algorithms to make the seed breeding process more efficient, producing a variety of legumes, sesame, and quinoa

Founded by **Gil Shalev**, Founder & CEO

[www.equi-nom.com](http://www.equi-nom.com)





# PLANT BASED

## ChickP (2016)

Rehovot, Israel

Produces concentrated chickpea protein used for meat & dairy substitutes and protein fortification for functional foods and nutritional supplements (Concentrate and Isolate)

**Ron Klein**, CEO

[www.chickpea-protein.com](http://www.chickpea-protein.com)



## Hinoman (2019)

Netivot, Israel

Produces the Mankai Plant, nutrient-rich super-vegetable

**Ron Salpeter**, CEO; **Udi Elituv**, Founder

[www.hinoman.com](http://www.hinoman.com)



## Innovopro (2013)

Raanana, Israel

Developed a technology designed to extract a 70% chickpea protein concentrate

**Taly Nechushtan**, CEO;

**Dr. Ascher Shmulewitz**, Founder

[www.innovopro.com](http://www.innovopro.com)



## Else Nutrition (2012)

Tel Aviv, Israel & Canada

Else Nutrition is an Israeli/NA food and nutrition company focused on developing innovative, clean and plant-based food and nutrition products for infants, toddlers, children, and adults. Its revolutionary, plant-based, non-soy, formula is a clean-ingredient alternative to dairy-based formula. Founded by **Hamutal Yitzhak**, **Uriel Kesler**, and **Michael Azar**

[www.elsenutrition.com](http://www.elsenutrition.com)



## NutriLees (2019)

Kiryat Shmona, Israel

Upcycled industrial wine byproduct made a food source - product contains proteins, dietary fibers, and minerals, with neutral taste

**Yochanan Gerber**, Co-founder & Chef; **Yaki Harel**, CEO; **Meir Shelisel**, Co-founder & CTO

[www.nutrilees.com](http://www.nutrilees.com)



## Plantish (2021)

Rehovot, Israel

Foodtech company developing plant-based seafood products.

Founded by **Ofek Ron**, **Dr. Ron Sicsic**, **Dr. Ariel Szklanny** & **Dr. Hila Elimelech**

<http://www.plantish.com>



## Yo! (2020)

Pardes Hanna-Karkur, Israel

Early-stage startup, developing a plant-based sunny-side-up egg sunny-side-up egg, soon to be available for the institutional markets in Israel and Europe.

Founded by **Nisim Ben Cohen**



## Alfred's (2021)

Modi'in, Israel

Utilizing a new technology to produce plant-based meat and cheese analogues.

Founded by **Rafi Shavit**

<https://www.alfreds.tech>



## Egg'n'up (2021)

Rehovot, Israel

Developing a sustainable alternative egg product, Egg'n'up is a subsidiary company of SavorEat (TASE:SVRT) utilizing SavorEat's unique technology.



## PLANT BASED

### Strauss Group

Plant-based ready to eat shawarma (Eat Good line), as well as Soom non-dairy desserts

[www.strauss-group.co.il](http://www.strauss-group.co.il)



### Tivall

Global and local pioneers in vegetarian-designated meat alternatives, produce frozen ready-to-eat processed meat substitutes. Their products and processes are protected by global IP, produce and distribute products in Europe

[www.osem.co.il](http://www.osem.co.il)



### Zoglo's

Produces frozen soy-based meat alternatives, including hot dogs, meat balls, burgers, chicken nuggets, kebabs, and schnitzel. Also produces some vegetable-based products like broccoli nuggets, corn nuggets, and cauliflower cutlets. Available in North America, Europe, Australia and Israel

[www.soglowek.co.il](http://www.soglowek.co.il)



### Segev

Frozen processed meat substitutes

[www.segevfood.co.il](http://www.segevfood.co.il)



### Tnuva Alternative

Produce a selection of non-dairy milk beverages, soy-based spreads, soy-based, almond-based and oat-based yogurts, and tofu

[www.tnuva.co.il/alternative](http://www.tnuva.co.il/alternative)



### Marina

Manufactures mushroom burgers

[www.marina-galil.co.il](http://www.marina-galil.co.il)



### Ocean Secrets

Seaweed-based red and black plant-based caviar, sold locally and abroad

[www.oceansecrets.co.il](http://www.oceansecrets.co.il)



### Tzuriel Farm

Manufacture milk alternative drinks in collaboration with Valsoia, as well as non-GMO tofu

[www.zuriel.co.il](http://www.zuriel.co.il)



### Wyler Farm

GMO free tofu, without preservatives, made in traditional methods alongside advanced technology. Products include traditional soy tofu in different tastes and textures, and chickpea tofu. Co-manufacturer of milk alternatives

[www.wyler.co.il](http://www.wyler.co.il)



### Harduf

Makes a selection of non-dairy milk beverages and tofu

[www.harduf.co.il](http://www.harduf.co.il)



# PLANT BASED

## Vegan Power, Connected to Life

Plant-based meat alternatives and alternative protein

<https://veganpower.co.il/>



## Taim Taim

Retail and Institutional caterers, exports to the US and Europe

[www.hamimvetaim.com](http://www.hamimvetaim.com)



## Teva Deli

Sells to retail and provides institutional catering services. Among their products are seitan and tofu based processed meat alternative dishes, as well as patties made from varied legumes, grains and nuts. Their institutional line focuses on raw ingredients for main courses, as well as dry soy chunks

[www.tevadelico.il](http://www.tevadelico.il)



## Mixoy

Makes the meat alternatives sold at Rami Levi stores, made from a mix of powders and water



## Nice to Meat

Makes soy-based meat alternatives, ready-to-eat meals, sold at retail and institutional markets



## Otentivee

Sells to retail and provides institutional catering services. Among their products are raw seitan and processed meat alternative seitan-based dishes, as well as patties made from varied legumes, grains and mushrooms

[www.otentivee.co.il](http://www.otentivee.co.il)



## Peas of Bean

Produces clean-label plant-based patties, burgers, falafel and ready-made mixtures made of a variety of beans, vegetables and herbs

[www.peasofbean.com](http://www.peasofbean.com)



## Vtopia

Vegan deli and factory, produces and sells their own non-dairy cheeses, plant-based meat-like mixtures, sauces, vegan food, and more at their stores: Rishon LeZion & Hod Hasharon, and website, delivers country-wide

<https://www.vtopiamarket.com>



## Perfect Foods

Gluten-free soy-based hamburgers, patties, sausages and mixture

[www.perfectfoods.co.il](http://www.perfectfoods.co.il)



## Zen Foods

Makes soy cheese-like spreads and veggie burgers

[www.zen-foodsltd.com](http://www.zen-foodsltd.com)



## Chef Man

Makes frozen and chilled ready-to-eat processed meat substitutes



## Isramarket Direct

Makes varied meat-like products out of texturised soy protein and other materials, sells at retail and also caters to institutional markets

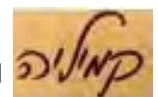
[www.soy.co.il](http://www.soy.co.il)



## Kamilia Coffee Cream

Coffee cream sold in retail and used in commercial flights

[www.facebook.com/pg/KamiliaCoffeeCream](http://www.facebook.com/pg/KamiliaCoffeeCream)



## Mama Q

Creates soy-based spreads

[www.facebook.com/MamaQVegan](http://www.facebook.com/MamaQVegan)



## PLANT BASED

### Mashu Mashu

Non-dairy hard cheeses and spreads, starch and oil based  
[www.mashumashu.co.il](http://www.mashumashu.co.il)



### Nut's Chef

Cashew-based spreads and semi-hard cheeses  
[www.thenutschef.co.il](http://www.thenutschef.co.il)



### Vega

[www.vegafoods.co.il](http://www.vegafoods.co.il)



### Plenty

Non-dairy cheeses made of nuts with no preservatives, available country-wide  
[www.plenty4u.co.il](http://www.plenty4u.co.il)



### Micol's

Nut-based boutique vegan cheeses  
[www.micol.co.il](http://www.micol.co.il)



### Tamiz

Almond-based yogurt drink, spread and semi-hard cheese  
[www.tamiz.co.il](http://www.tamiz.co.il)



### Lilac's Aromas

Green Soy products using unique enzymes which coagulate the soy milk & enable bacterial, (i.e. Probiotic) processes similar to milk processes. Creating popular household cheese like Soy products which are healthy Lactose & Gluten free, Vegan, Natural & Low Fat.  
[www.facebook.com/lilacsaromas](http://www.facebook.com/lilacsaromas)



### Teva Haadam

Almond, coconut and soy-based spreads, creams and semi hard cheeses, as well as scrambled eggs-like mixture  
[www.facebook.com/tavaadam](http://www.facebook.com/tavaadam)



### Teva Haaretz

Cream Soy spreads, Yellow Soy cheese, tofu  
[www.tevaharetz.com](http://www.tevaharetz.com)



### Einut's

Nut-based spreads and semi-hard cheeses, food and desserts  
[www.einuts.co.il](http://www.einuts.co.il)



### Utopi

Nut-based and soy-based fermented spreads and semi-hard cheeses  
[www.facebook.com/utopivegan](http://www.facebook.com/utopivegan)



### Gvinashew

Cashew-based vegan cheese, sold to individual and institutional clients  
[www.gvinashew.com](http://www.gvinashew.com)



# NOVEL INGREDIENTS, TECHNOLOGIES AND PLATFORMS

## BioBetter (2015)

Kiryat Shmona, Israel

Protein manufacturing and biologic drug purification platform, tobacco-plant-based expression mechanism for cultivated meat growth factors

**Prof. Oded Shoseyov**

<https://biobetter.bio>



## Amai Proteins (2016)

Rehovot, Israel

Develops and produces protein-based ingredients for many applications, combining integrative computational protein design (AI-CPD) with biotechnology-based production.

**Ilan samish**, Founder & CEO

[www.amaiproteins.com](http://www.amaiproteins.com)



# SERVICES

## ICL

Tel Aviv, Israel  
Chemicals

Global manufacturer of products in three markets: agriculture, food and engineered materials

[www.icl-group.com](http://www.icl-group.com)



## Berlin Technologies

Yavne, Israel  
Equipment

Importer of industrial machinery and spare parts, the official Israeli representative of global companies from the fields of filling and packing, pumps, process control and analysis, filtration and air compression and other types of industrial equipment

[www.berlintech.co.il](http://www.berlintech.co.il)



## BPL Biologics

Yavne, Israel  
CMO

Contract Development/Manufacturing Organization (CDMO) for the biotech sector, focuses on recombinant protein design, process development, and production for various uses

[www.bplbio.com](http://www.bplbio.com)



## David Wittenberg & Co. Engineers

Tirat Carmel, Israel  
Equipment

Process equipment for the chemical, mineral pharmaceutical and food industries

[www.dwl.co.il](http://www.dwl.co.il)



## SERVICES

### SBTech (Patheon partners)

Netanya, Israel

CMO

Contract development and manufacturing organization, end-to-end supply chain solution, development and manufacturing, spanning all phases and scales

[www.sbtechglobal.com](http://www.sbtechglobal.com)



### Tasgiv Engineering

Raanana, Israel

Equipment

Offers process and packaging equipment, as well as technical support and on-site services

[www.tasgiv.com](http://www.tasgiv.com)



### Bio-Chem

Rehovot, Israel

Consulting

Provides consulting services on product development, technology, facility design, regulation and registration, quality, GxP and manufacturing

[www.bio-chem.co.il](http://www.bio-chem.co.il)



### Trident

Kfar Saba, Israel

Equipment

Distributor of machinery

[www.trident.co.il](http://www.trident.co.il)



### YOS Machinery

Kochav Yair, Israel

Equipment

Industrial machinery, consultation and solutions provider for food industry

[www.yos4u.com](http://www.yos4u.com)



### BioForum

Ness Ziona, Israel

Knowledge Center

Courses and seminars, consultation and professional guidance services, medical writing

[www.bioforum.org.il](http://www.bioforum.org.il)



### Hylabs

Rehovot, Israel

Equipment, Lab

Developer, manufacturer and distributor of tools for detection and identification of microorganisms and molecular biology products

[www.hylabs.co.il](http://www.hylabs.co.il)



### MIGAL

Kiryat Shmona, Israel

Laboratory Services

Specializes in biotechnology and computational sciences, plant science, precision agriculture and environmental sciences as well as food, nutrition and health.

[www.migal.org.il](http://www.migal.org.il)



### Food Lines

Food Process Consulting

Food Lines takes your product from idea to full scale production line. We offer

product development and process planning, while optimizing efficiency and minimizing cost. We believe that promoting sustainable

products and manufacturing is a key to success in the new world.

<https://www.food-lines.com>



### Petrus

Herzliya, Israel

Equipment

Represents in Israel global leading suppliers of equipment; know how, systems and chemicals

[www.petrus.co.il/en](http://www.petrus.co.il/en)



# SERVICES

## Reinhold Cohn Group

Tel Aviv, Israel

IP

Intellectual property consulting firm, offering a full range IP services.

[www.rcip.co.il](http://www.rcip.co.il)

## The Luzzatto Group

Tel Aviv & Omer, Israel

Patent Attorneys and Law Firm

Includes the patent law firm Luzzatto & Luzzatto, as well as the Luzzatto Law Firm, which specializes in intellectual property and commercial law, along with other services.

[www.luzzatto.co.il](http://www.luzzatto.co.il)



## Agbiopro

Alonei Abba, Israel

Management, IP, Licensing

Management and consulting firm offering a comprehensive menu of services to startups and biotechnology companies.

[www.agbiopro.com](http://www.agbiopro.com)



## BTG

Beer Tuvia, Israel

R&D

R&D and manufacturing for the pharmaceuticals industry

[www.btgil.com](http://www.btgil.com)



## Tel Hai College

Kiryat Shmona, Israel

R&D

Service labs

[www.telhai.ac.il](http://www.telhai.ac.il)



## I.M.A.

Kibbutz Ein Hamifratz, Israel

Packaging

Corrugated cardboard packaging manufacturers. Also owns two subsidiary companies in the south of Israel: Arizot Sderot Ltd, a corrugated packaging and cardboard sheets manufacturer, and I.M.A. Ravsai, a company supplying cardboard containers and complementary packaging to farmers

[www.ima.co.il](http://www.ima.co.il)



## Tetra Pak

Netanya, Israel

Processing, Packaging

Food processing and packaging solutions company

[www.tetrapak.com](http://www.tetrapak.com)



## Gsap

Haifa, Israel

Regulatory Affairs, Validation & More

Regulatory, Clinical, Quality & Validation Processes services

[www.gsap.co.il](http://www.gsap.co.il)



## RS NESS

Netanya, Israel

Regulatory Affairs, Validation & More

Offers a breadth of Engineering, Project Management, Quality Assurance, Validation, Regulatory Affairs, Clinical-Affairs, and MicroBiological Services

[www.rs-ness.com](http://www.rs-ness.com)



## SERVICES

### Daren Innovation Centers



Ness Ziona, Israel  
R&D, Lab, Consultants

Provides custom R&D and expert knowledge, analytical lab services, technology-based accelerator (resources to early-stage projects, including dedicated laboratories, scientific guidance and professional consulting)

[www.darenlabs.com](http://www.darenlabs.com)

### BioDalia



Kibbutz Dalia, Israel  
Scale-up Services

Offers industrial fermentation and scale-up services of bio fermentation from lab to 25,000 liter fermenters as well as complete bio- process development

[www.biodalia.com](http://www.biodalia.com)

### Leading Edge Consultants



Tel Aviv, Israel  
Strategy

Business and growth strategy, due diligence studies

[www.leadingedge.biz](http://www.leadingedge.biz)

### Tetra Sense



Caesarea, Israel  
Scientific Solutions

provides scientific solutions for R&D, formulation development, QC and production

[www.tetrasense.co.il](http://www.tetrasense.co.il)

### Sher Consulting & Training Ltd.



Tsur Yigal, Israel

Regulatory Affairs, Product Quality and Safety  
Food regulatory affairs, product quality & safety

[www.2sher.co.il](http://www.2sher.co.il)

### Make Eat



Rishon Lezion, Israel

Shared Kitchen, Food Incubator  
Shared kitchen space for monthly lease, with manufacturer's license

[www.makeeat.co.il](http://www.makeeat.co.il)

## INCUBATORS

### The ACT Hub

Tel-Aviv, Israel

Connecting food tech to the culinary world, seeking entrepreneurs who possess disruptive food technology

[www.theacthub.com](http://www.theacthub.com)



### The Kitchen FoodTech Hub

The Kitchen

Ashdod, Israel

FoodTech Hub

Seeking FoodTech ventures that can disrupt the global food system

[www.thekitchenhub.com](http://www.thekitchenhub.com)

### Fresh Start FoodTech Incubator

Kiryat Shmona, Israel

Pre-Seed & Seed Foodtech incubator

[www.fresh-start.co.il](http://www.fresh-start.co.il)



### InNegev



Rahat, Israel

Hi-tech incubator for early-stage startups in the fields of Agritech, Cleantech, and Industry 4.0, a collaboration between many of Israel's industrial, academic, and financial institutions, dedicated to fostering top-tier Israeli innovation and generating growth in the Negev region.

[www.innegev.com](http://www.innegev.com)





Israel  
Advanced  
Technology  
Industries

In Partnership with



רשות החדשנות  
Israel Innovation  
Authority

2021

# IATI Israel's Life Science Annual Industry Report

 *Connecting Israel's Tech Ecosystem*

With the support of



In Cooperation With



# Israel Innovation Authority



<https://innovationisrael.org.il>

The Israel Innovation Authority is an independent public agency, promoting the Israeli innovation eco-system in order to advance Israel economy growth. The Authority's roles are to initiate state-funded R&D activities and to award funding to entrepreneurs and industrialists.

The Innovation Authority funds R&D projects for its diverse range of clients – first-time entrepreneurs, young startups, growth companies, industrial corporations, and others – in all fields of technological innovation. The Authority offers designated funding programs for companies' R&D projects or for collaborations in R&D with researchers in academia, global partners, testing sites for conducting pilots, and more

## ADVANCED MANUFACTURING DIVISION – ISRAEL INNOVATION AUTHORITY

<https://innovationisrael.org.il/mfg>



### Mission:



Strengthen the **Industry** competitiveness, locally and globally, by applying innovation and R&D process



Focus on **small and medium-sized factories** to develop innovative **products, technologies** and manufacturing **processes**

## The Division offers a range of supportive tools:

1.

### R&D Preparatory program

conducted with a technology expert, the program supports companies without prior R&D experience in leading innovation processes, or companies that require focus and guidance with their R&D activities (including Technology feasibility testing, Productivity solutions and Manufacturing readiness plans)

2.

### MOFET - R&D in the Manufacturing Industry

The MOFET Incentive Program support factories with executing clear R&D plan for the development of new products; Development of new manufacturing process; or advancing production productivity.

3.

### From R&D to Production

the program supports companies in successfully transitioning from R&D to Production ramp-up. Projects submitted to the open call will focus on process design to Manufacturability.

## Who is eligible for the incentive programs?

Israeli-registered manufacturing companies that most of its revenue stems from Industrial manufacturing of products OR companies preparing for manufacturing production, after completion of product prototype.

## What is the incentive?

- Financial funding of **30%-50%** of the approved program's R&D expenses
- Additional **10%** for R&D projects in Israeli Periphery based factories
- Additional **10%** if at least **20%** of the project budget is allocated to a recognized Academia or Israeli research institute
- Unique R&D expenses are approved for Manufacturing needs, like development of molds; development of unique production machinery; scale-up and commercialization and more.

## Why should you apply for this incentive program?

### **Entry to new markets:**

the incentive program enables all manufacturing factories to implement advanced technologies in their field of operation, via technological solutions that accord them a competitive advantage and enable entry to new markets.

### **Improved R&D conditions:**

the incentive program offers improved conditions for small companies, manufacturing in Israel, to carryout R&D programs.

### **Attractive Financing Model:**

the incentive program offers financial support of up to 70%.

Manufacturing companies that meet the track criteria, and Manufacture in Israel may be entitled to an exemption from royalties. For the full exemption conditions, please refer to the Innovation Authority website.

The full and binding list of conditions and criteria appears in Incentive track no. 36 – Industry Technological Innovation, which can be found on the [Israel Innovation Authority website](#).

Modern Agriculture Foundation

## Antibiotic Resistance - The New Era

**About 90 years ago, humanity breathed easy with the invention of antibiotics, and many human lives were saved. In the age of modern agriculture and the widespread use of antibiotics in livestock, bacteria have developed resistance to the wonder drug. Super strains created threaten to kill more humans than cancer. Are the antibiotics about to expire? Will we soon face the next pandemic?**

Fleming rolls over in his grave. One of the most common phenomena in the world today is bacterial resistance to antibiotics. The super-capabilities of the miracle drug that saved millions from death are eroding. The prevailing view among scientists and medical professionals is that in the coming years, more people will die from infections than from cancer. This is one of the main threats to the global health system - a substantial medical crisis. Have you been stressed out about coronavirus? This was likely just a preview. The next pandemic will be a result of resistant bacteria, which will win the war against medical treatments. Furthermore, these resistant bacteria will cause more severe and enduring illnesses that need intensive care, will overburden the healthcare system, and cause significant economic disruptions. In the war between the germs and us, they have the upper hand. According to the theory of evolution, resistance is expected to develop in bacteria exposed to antibiotics, and the world's population will be left with no protection.

### Why is This Happening?

Beyond the irrational use of antibiotics as a treatment for various health problems, the most extensive use of antibiotics is in the livestock industry. Billions of animals grown in this industry, for the purpose of producing meat, cheese and eggs, are force-fed daily with antibiotics to prevent the spread of diseases arising from overcrowded and poor sanitary conditions in factory farms. Antibiotics are also used as a growth catalyst for farm animals to streamline the process and increase profits. In the U.S., more than 40% of the antibiotics produced are intended for livestock. Antibiotic remnants make their way to humans via animal products, and the bacteria in their body develop resistance. The rapid emergence of antibiotic resistance characterizes evolution by way of natural selection. As with any other creature, each time bacteria multiply, random mutations in the DNA can occur. Some of these mutations could create a super strain that would make the bacteria antibiotic resistant, and give it an advantage over the most effective tool modern medicine has against it. When we use antibiotics, it destroys the sensitive bacteria, but the resistant mutants survive and thrive, thus preventing future cures for simple diseases and trivial infections.

## What Do We Do?

Of course, it is possible to monitor the amount of antibiotics used in the industry (although these are regulations and bureaucratic procedures that will probably not be implemented), yet it is impossible to grow such large numbers of animals without the use of antibiotics.

The second option is to grow meat in the laboratory, without the process of raising and slaughtering animals, the so-called "cultured meat". It sounds futuristic but despite the cliché, the future is already here, and start-ups specializing in the production of meat which is not from a body of an animal are thriving and are in an advanced process of production. The development and production of laboratory meat provide a response to the acute need to solve the climate crisis and to cope with the demographic growth of the world's population following the extension of life expectancy. The earth is increasingly struggling to feed its many inhabitants, as resources and climate change become increasingly significant and threatening. Cultured meat would allow people to enjoy delicious and nutritious meat without slaughter, and with reduced emissions and carbon footprint.

Try to imagine a world in which the meat industry becomes history, and with it all polluting farms (coops, dairy farms, slaughterhouses, factories). In their place, a clean and economic high-tech industry is established, in which the meat "grows" in laboratories and the world's diet is mainly based on plant protein. This will allow us to avoid pandemics, pollution, climate change, and spare billions of animals annually from untold suffering,

**Loren Segal Cohen,**

Modern Agriculture Foundation





# Biopharm Labs

Biopharm Labs provides one-stop-shop CMO / CDMO services for the biotechnology sector, focusing on recombinant protein design, process development, and production for various applications.

Since the year 2005, BPL's team commits its experience and know-how to assist hundreds of its customers to successfully achieve their goals at the best cost and time.

## Contact Us

+972 (0)549-536-6396 [✉ meir.biom@gmail.com](mailto:meir.biom@gmail.com)

[www.bplbio.com](http://www.bplbio.com)



## The New Era of Smarter Food

The food industry is quite complex. Not only do we rely on various suppliers to deliver food, we also require many foods to be fresh, tasty, and full of nutrients. Problems arise due to this convoluted, interdependent chain, such as where our food is truly coming from and how fresh it really is. For example, in 2015, [an outbreak of E.Coli](#) in Chipotle restaurants caused the company to shut down operations temporarily in multiple U.S. states. Today, it is evident that the demand for transparency will increase exponentially, and food chains, manufacturers and retailers alike are looking for ways to stay up-to-date with customer preferences, emerging trends, prices and transportation needs, etc.. How can they collect meaningful data that will provide the necessary insights? The answer is big data.



Big data [weaves data from new sources](#) like social media with traditional data sources, enabling a larger scope into a company's environment and providing significant value. Big data [works well in the food industry](#), as it enables companies to track

the growth rate of competitors, monitor prices, track ingredients, determine proper storage methods, and so on.

The way we grow, produce, process, distribute, and consume [can all be tracked with big data](#), and create links to areas such as diet and health and certain foods to health risks or diseases. Let's dive into some exciting opportunities big data has to offer the food industry. We are looking at the following changes; agriculture, improved customer experience, smart labeling, improving food delivery and personalized nutrition.

### Big Data Increasing Crop Yield

The farming industry can benefit from big data via sensors, irrigation data, historical data from soil and weather patterns, what types of pesticides are used and so on. Understanding patterns and correlations can increase crop yield, minimizing loss and costs and give farmers proper warnings for potential disruptions.



Agricultural analytics is expected to grow from \$585M in 2018 to \$1236M by 2023, at a [CAGR of 16.2%](#). Companies like Israeli-based [Sensilize](#), are

creating a 'digital cloud' for crop management, providing farmers insights for smart crop health and management. An area big data can alleviate in regards to the supply chain of agriculture is having [greater oversight when it comes to crop harvest seasons](#). Providing insight into what particular crop and in what quantity can really help farmers better understand what they can supply.

## Improving Customer Experience at Restaurants

Restaurants will benefit from big data as it uses the information to provide tailored offers, improve recipes and reduce food waste, for instance. Building complex, predictive models allows businesses to offer perks such as a free parking space for a frequent guest or optimizing menu prices.



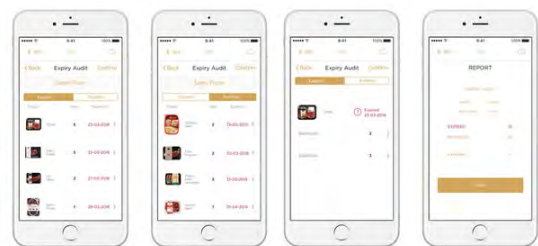
*Cava is a Mediterranean-Style chain restaurant using [customer-flow data via sensors](#) along its queues that help decrease order processing times and in turn improve the customer experience.*

Whether it's enhancing a menu, creating a custom experience, having the right customer segmentation, or streamlining operations, big data has a bright future in the restaurant industry.

## Smart Labels and RFID on Food

Some companies now use smart labels in which a consumer can scan a barcode and understand where the ingredients are coming from and what the nutritional content is of the foods they are consuming. Smart labels will bridge the communication between producers and consumers, creating trust and a direct form of communication.

In addition, RFID tags can create intelligent inventory management. Since food has to be monitored closely, an RFID system can cut shelf-life costs in half. RFID also provides 99% stock accuracy, so safety stock can be reduced, resulting in inventory shrinkage from expiration dates.



*Potential inventory management system for staff, leading to consumer satisfaction and less spoilage.*



## Improved Food Delivery

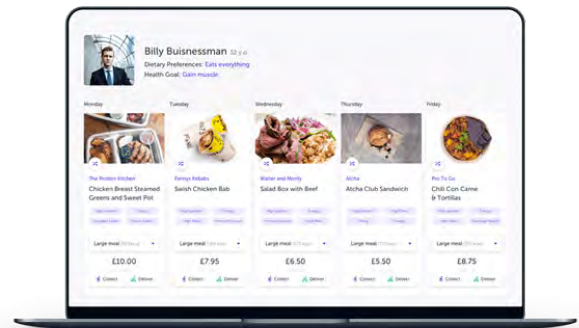
Food delivery services can utilize Big Data via analysis of traffic, route changes, weather, road blockages. [FreshDirect](#) is using sensors to monitor transportation and delivery statuses. Food delivery companies will have similar opportunities to restaurants to make improvements. In addition, [using smart algorithms](#), these companies can also predict demand, as in what the customer's next order will be, estimating how many customers will order and at what time of day.

## Personalized Nutrition

Improving one's health is a personal journey - what works for some may not work for others. Due to this complexity, recommendations for personal nutrition range based on behavioral, physical, and attitudinal data that is specific to an individual - determined by genetics and metabolic makeup. Given that the personalized nutrition market is projected to reach [\\$11B by 2026](#), with demand of food apps, testing kits, wearables [contributing to this growth](#).



Big data can collect personal preferences, specific data points from users and make consistently better improvements for its recommendations. Analyzing nutritional information, suggesting meals, giving advice on what a specific user should buy or integrating at-home kits with online platforms for health monitoring purposes are just the surface of big data's capabilities in the personalized nutrition space.



[Nutrifix](#), a British startup providing companies with a [virtual staff canteen and tailored weekly meal plans](#) from local restaurants. The app utilizes individual's data points such as age, weight and health goals to calculate and guide users on [what their body needs](#).

### About the author:

**Molly Roklen** is from Los Angeles, and moved to Israel to pursue her MBA at Tel Aviv University. She is passionate about food technology, and is using her time in Israel to explore the amazing innovations in this space. She is currently working as an analyst at ACT FoodTech.



## COVINGTON

### Cell-Based Meat Readies for Prime Time in US and Globally

By Brian P. Sylvester, Jessica P. O'Connell, and Miriam J. Guggenheim

Singapore's [greenlighting](#) of a cell-based meat product last December represents a global first and an inflection point in the rapid rise of alternative proteins around the world.

Also known as cultivated meat or cell cultured meat, cell-based meat replicates the organoleptic, nutritional, and compositional characteristics of meat tissue harvested from food-producing animals. Investments are pouring in. For example, USD \$189 million was raised by cell-based meat companies in the first quarter of 2020 alone, more than the amount invested in the sector's entire prior history, leading to much needed advancements on the road to scaling up production. And global regulators are seeking to develop appropriately tailored regulatory frameworks.

In the US, the Food and Drug Administration (FDA) and the Department of Agriculture (USDA) are moving quickly considering the novelty of the production process and the need to ensure that labeling claims are accurate and provide consumers with sufficient information about the products.

#### US Developments

A Memorandum of Understanding (MOU) outlines how the US will regulate cell-based meat, poultry, and seafood products within existing statutory frameworks. The MOU clarifies that FDA will oversee cell collection and propagation up to the point of harvest of meat or poultry from the bioreactor, after which jurisdiction for meat or poultry products shifts to USDA's Food Safety and Inspection Service (FSIS). Cell-based seafood and game meat will be overseen solely by FDA.

Three interagency working groups managed by FDA and USDA are working to flesh out details of oversight: (1) premarket safety, (2) transfer of jurisdiction from FDA to USDA at the harvest stage and (3) labeling.

#### The US Labeling Debate

Labeling is a hot-button issue in the US. In addition to a petition urging USDA to revise definitions of meat and beef to exclude cell-based, several states, like Louisiana, Missouri, and Mississippi have passed laws prohibiting cell-based foods from bearing conventional meaty terms, like "meat," "beef," and "chicken," if those terms misrepresent the products as being derived from harvested production livestock or poultry - though many state laws allow for the use of a qualifier such as "cell based" as a means of clarifying the origin of cell-based products. Legal challenges to these laws are ongoing in Louisiana, Missouri, and other states in which such laws have been passed.

USDA is considering new regulatory requirements for cell-based meat and poultry, and has said it will align with FDA on key labeling principles. The evolving patchwork of state legislation will likely impact the labeling discussion at FDA and USDA and could add support for federal uniformity.

### Singapore's Potential Influence

Singapore offers an easily navigable recently revamped regulatory landscape to facilitate alternative protein production. The Novel Food Safety Expert Working Group at the Singapore Food Agency (SFA) spearheads review of new food technologies, ostensibly rivaling highly regarded regulators around the world.

Singapore's cell-based meat approval likely sets the stage for other Asian jurisdictions, particularly southeastern Asian countries, to follow suit. China is also exploring research and development of cell-based meat, although its laws and regulations around this issue are still developing and new foods can often take time to obtain approval. And the Japanese government embarked on a project in 2020 to develop standards to directly permit the sale of cultivated meat, among other alternative sources of protein.

### Looking Ahead

We expect the SFA nod to further foment regulatory conversations around the world, including in the US.

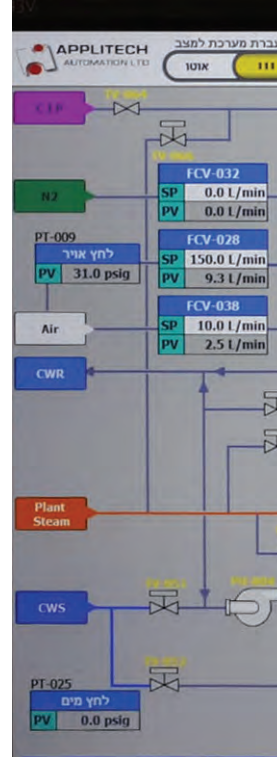
The considerations outlined above mean we will have a few more steps to go before cell-based meat enters the US market. In the short term, we're likely to begin seeing tangible direction from key global regulators on issues like premarket safety and labeling.

#### About the authors

**Brian P. Sylvester** is special counsel at the international law firm of Covington & Burling LLP and a member of the Firm's globally leading Food, Drug, and Device Practice Group. He is a former USDA regulatory lawyer and advises FDA and USDA-regulated companies and trade associations on a broad range of regulatory, legislative, and compliance issues, with an emphasis on food tech.

Jessica P. O'Connell, former Associate Chief Counsel at FDA and partner in Covington's Food, Drug, and Device Practice Group, provides strategic advice to a broad range of companies and trade associations in engaging with food and drug regulatory bodies and Congress.

**Miriam J. Guggenheim** is a Partner and Co-Chair of the Food, Drug and Device Practice Group at Covington & Burling LLP. Ms. Guggenheim is ranked as one of America's Leading Business Lawyers, Food & Beverages: Regulatory & Litigation by Chambers USA. As counsel to a broad range of leading global food and dietary supplement companies and major trade associations her work includes regulatory advice, advocacy before regulators, courts and legislative bodies, and strategic counseling in light of overarching public health and nutrition policy considerations.



# Lab to Pilot Scale Fermentation Services

**Better Air offers lab to pilot scale fermentation services in its new pilot plant in Netanya:**

**15L**

New Brunswick Scientific  
BioFlo 2000 fermentor

**75L**

New Brunswick Scientific  
IF-75 fermentor

**300L**

ABEC 300  
LU fermentor

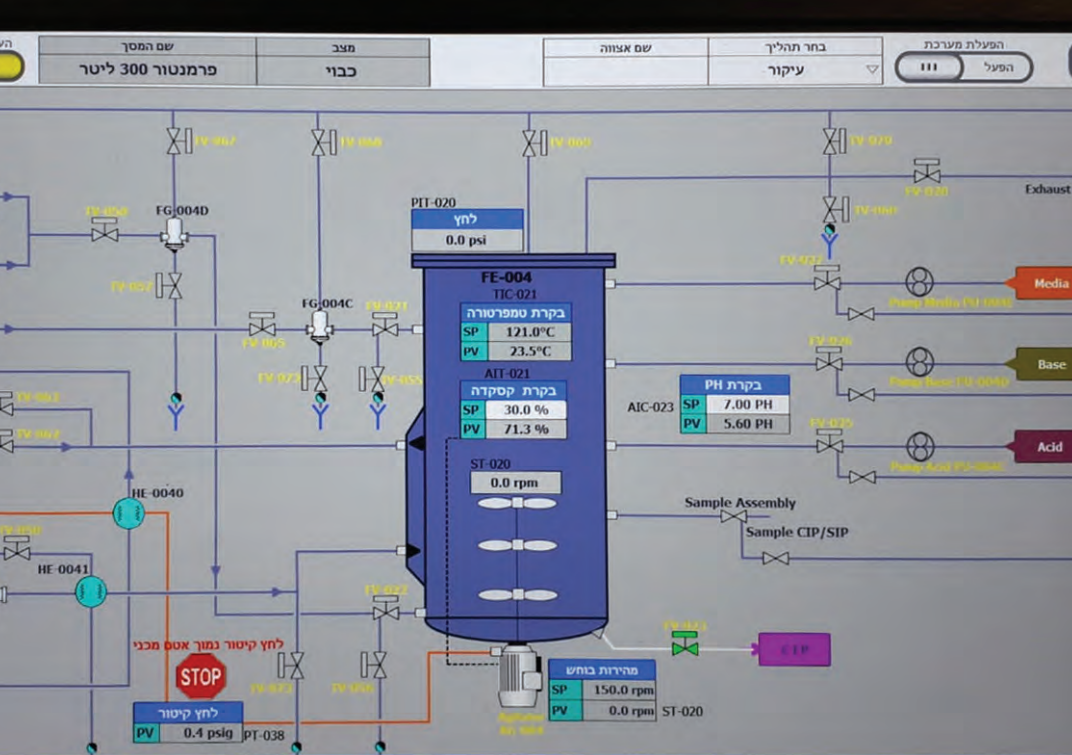
The fermenters are fully controlled (temperature, pH, DO, Agitation, aeration, pressure), 316L – stainless steel fabricated and enable Oxygen Transfer Rate (OTR) of 350 mM02 L-1H-1.

The versatile 300L fermenter is uniquely designed also for cell-culture bioprocesses.

## DSP - Cell separation

**Sorval RC5C Plus** and **Hermle ZK-496** centrifuges are used to separate the 15L fermentor culture.

A continuous 20,000g **Carr-Kendro Powerfuge P6 Separation System** is used to centrifuge the 75L and 300L harvested culture, yielding solid paste.



### Microbiological lab

The fermentation processes are supported by an advanced microbiological lab equipped with temperature controlled shaker incubators, biological hoods, -80 freezers, spectrophotometers, microscopes, A qPCR system and all required auxiliary components.



### Technological expertise

The dedicated team is experienced in developing, performing and scaling up bio-processes of bacterial, yeast and fungal cell biomass, cell culture, as well as alternative proteins, enzymes, small molecules and bio-pharmaceuticals for pre-clinical use.



### Mission statement

Better air is dedicated to providing biotech companies and academic institutions with the highest standards of professional performance for their unique bioprocess needs.

## Contact:

**Moti Rebhun PhD**, CTO Better Air

Co-founder and CEO of the Israeli Fermentation Society



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## Supply Chain Management Effects on Alternative Protein Companies

Transitioning from animal-based agriculture to the alternative protein industry has immediate implications for global consumer goods markets, in terms of supply chain management.

One of the effects is the expansion or adjustment of the production capacity of food components, required for the plant-based protein industry, to the processes of fermentation and cultured-meat production. Supply chains in classical agriculture focus on optimizing the production of nutrients for animals. In contrast, alternative agriculture demands state-of-the-art agricultural technologies, clear regulatory tracks, and innovative manufacturing processes.

A great variety and lack of validation of raw materials may cause production barriers, increase technological risks in finding alternative manufacturing solutions, thicken the risks in terms of food safety, and hinder these products' global supply chain.

Food safety is the main issue in new manufacturing processes and where all new food regulations are focused, both in Israel and worldwide.

**The main issues in maintaining a continuous supply chain in the field of alternative protein are:**

- Food safety and public health: Requiring information and risk assessment in terms of toxicology, allergens, microbial and chemical safety, while setting quality metrics for alternative proteins' production processes.
- Complete consistency, from raw materials to finished product.
- Availability of information in terms of sustainability, environmental protection (Eco footprint), and risk management throughout the supply chain.

In the past year, we have witnessed significant growth in the development of alternative protein technologies and companies in Israel and abroad. Companies range from traditional food companies with extensive experience, which accelerated developmental processes, to young start-ups based on technological and ideological innovation. The players on the alternative protein field face the same challenges along the chain. Building optimal processes that comply with regulatory and consumer requirements is key to rapid response times towards market requirements.

One major challenge is international shipping, especially the growing requirement for temperature-controlled transportation between various sites, which calls for special preparation

(packaging, etc.). Also, a unique customs procedure is required both in Israel and in other countries, yet shipping companies are not quite well versed in classifying the products. Sometimes, even a simple delivery of samples might delay a long time, eventually undergo an extermination procedure, or be returned to the sender in the country of origin.

We strongly believe that one solution would be mutual learning through professional forums, contributing to the connection between various players, building optimal processes, and serving as a platform for advanced solutions for effective and proactive supply chain management.



For additional information and interesting networking, please contact - Israel FoodTech Logistics Forum Managers:

**Mira Reuven**, Experienced Food Technologist and Regulatory affairs manager with a unique experience in dietary supplements' R&D, QA, different scales production. Skilled in finding the best production plan and sourcing, Good Distribution Practices (GDP), ISO, HACCP and GMP. Strong Quality Assurance professional, procurement and supply chain expert.

**Shay Haimov**, Chairman of Israel Pharma & Medical Logistics and Israel FoodTech forums. Experienced Chief Executive Officer with a demonstrated history of working in the international trade, Healthcare logistics industry. Skilled in Supply Chain Management, Clinical Trials, Freight Forwarding, International Business and Temperature Controlled Logistics.





Leading Edge Consultants

## A Fertile Land for Alternative Protein Scale Up

Author: **Raviv Kerem**, Food-Tech Manager, specializing in the Alternative Protein segment

Co-Author: **Asaf Ulmansky**, Managing Partner

### Leading Edge Consultants

The Israeli retail food industry is a challenging one. Consumers tend to stick with familiar loved brands, and about 80-85% of product launches fail<sup>1</sup>. Despite this, interests in "new" categories of plant-based products are emerging with exciting-hyped brands, such as Beyond Meat that entered the market thundering with a 13.5% take<sup>2</sup>.

Covid-19 has made an enormous impact on grocery retail sales, bringing the alternative protein (AP) market to unprecedented growth. Even when excluding the general spike in FMCG (Fast Moving Consumer Goods) retail sales due to the pandemic, categories such as plant-based meat and milk are still booming with 48.8% and 27.3% growth respectively<sup>3</sup>.

There are over 250 startups in the Israeli Food-Tech ecosystem<sup>4</sup>, many of them dedicated to novel ingredients for the AP space. These startups are rapidly growing and will need to scale up effectively. Commercial scaling involves making critical strategic choices that hold a massive impact on the company's focus and cash flow.

Most Israeli startups have chosen to move their manufacturing endeavors to larger markets in the US and Europe, undertaking substantial risks and signing restrictive partnership agreements. This move often occurs without a sufficient pilot, lacking end-user feedback.

Surprisingly or not, Israeli retail sales data is going toe-to-toe with the US, as plant-based milk's share of total liquid milk stands at 13% and 14% respectively. In the case of plant-based meat, we are even surpassing the US, with 7% vs. 1% share of total retail meat<sup>5</sup>. These and other similarities make the Israeli consumers a perfect pilothouse or commercial launching pad.

1 Nielsen: Setting the record straight on innovation failure. 2018

2 Calcalist – Beyond Meat's Bite of Osem. Feb, 2021

3 StoreNext: Post Covid Sales Data. 2020

4 SNC– Active Foodtech Startups

5 GFI: Plant Based Meat Eggs and Dairy. 2019



To fit this need, Leading Edge Consultants (LEC) was invited by the Modern Agriculture Foundation (MAF) to conduct a feasibility study for a new type of production facility, one specifically customized for protein alternatives. Kindly named 'The Flower' it is designed to include the specialized machinery required to create such novel products and ingredients.

'The Flower' will be a CMO (Contract Manufacturing Organization) that provides food AP manufacturers a chance to test new products on pre-built lines. Thus, eliminating substantial capital expenditures and also allowing startups to scale up commercially.

'The Flower' stands for a vision waiting to blossom. Its vision is that the Israeli Food-Tech and alternative protein ecosystems will join forces and use their combined potential to create a technological and financial synergy. To lower costs and risks for individual companies while bringing food competitors faster into the market. A chance to make our nation prestige shine not only through our startups but via our scale-ups.



# Israel Innovation Authority



<https://innovationisrael.org.il>

## The Innovation Authority

The Israel Innovation Authority is an independent objective public agency responsible for Israeli innovation policy. The Authority strives to advance the

innovation ecosystem in Israel and the economy in general. Its role is to cultivate and develop the innovation resource in Israel while creating relevant infrastructures and strengthening the structural foundations that provide the supportive framework for the entire knowledge-based industry.

## Startup Division

### Who for?

Entrepreneurs and startups in the early stages of conceptualization and corporations interested in operating incubators and laboratories.

### What?

Development of a preliminary technological idea into a product with the aim of reaching advanced fundraising stages and sales.

### How?

The Division provides a range of unique tools that support the initial development stages of technological initiatives – R&D grants, incubators, labs.

## ..... Ideation (Tnufa) Incentive Program .....

The Ideation (Tnufa) incentive program is intended for fledgling entrepreneurs who are interested in formulating and advancing an innovative technological concept to the R&D stage where they can raise funding for further development and commercialization.



### Goal of the incentive program:

To support the project's technological feasibility and commercial practicality with the aim of enabling the entrepreneur to locate a business partner and/or private fund raising for the idea's continued development.

## Who is the incentive program for?

- A private entrepreneur or consortium of entrepreneurs
- New startup companies (in accordance with the guidelines) in all sectors of industry.

## Why should you apply for this incentive program?

Favorable conditions for entrepreneurs: the entrepreneurs are not obligated to leave their place of work or establish a company as a condition for receiving support in the Ideation (Tnufa) incentive program. The entrepreneur is not required to give up his rights to the project.

Quality mark support: the support of the Ideation (Tnufa) incentive program allows entrepreneurs to test the feasibility of their projects, as it reflects a professional and objective vote of confidence in their potential. This can help entrepreneurs raise additional capital following the initial financing support.

## Technological Innovation Incubators Program

The Incubators Program is intended for entrepreneurs interested in founding a startup company based on an innovative technological idea via a technological incubator that constitutes an entrepreneurial center. The incubator's role is to invest in companies in their early stages and to provide a framework that supports the establishment of the company, and the development of the idea into a commercial product.

The list of technology incubators appears on the Innovation Authority website.

## Goal of the incentive program:

To support entrepreneurs with a technology idea in the early stages of R&D who are having difficulty raising private financing and who need the labs' support to reduce the project's risks and achieve a significant funding milestone.

## Who is the incentive program for?

- Private entrepreneurs interested in founding startup companies within the framework of the incubators.
- New Israeli startup companies owned by private entrepreneurs who are interested in developing a commercial product.
- Researchers and institutions that are interested in establishing startup companies with the incubators on the basis of groundbreaking studies.

## Why should you apply for this incentive program?

Attractive conditions: the entrepreneurs are not required to establish a company before the project is approved by the Innovation Authority. The incubator provides the entrepreneurs with the infrastructure necessary for setting up the company and developing the project.

Experienced partner: the incubator is a partner with vast experience and expertise in leading startups and commercializing products. It facilitates follow-on investments in companies that have graduated from the incubator and assists them in raising financing and preparing for product marketing, including penetration of target markets.

Attractive conditions: low risk, high leverage, a degree of certainty.

For further details, contact:

Startup Division | Email: [SU@innovationisrael.org.il](mailto:SU@innovationisrael.org.il)

## Cultivated meat and milk innovative technologies are often too complicated for news reporters to comprehend.

This technology has the potential to change the world in so many ways, but most of the news stories are focused just on the taste of emerging products, their price, and projection about when clean meat and milk will be available in the market.

Issues like the devastating impact of the traditional animal products industry on climate change, global warming, water pollution, land contamination et cetera would not be part of news stories about clean meat or milk. Potential hazards to the health of meat and milk heavy consumers, due to the wide use of antibiotics and steroids in the traditional industry, likewise spread of viruses and bacteria in overpopulated slaughterhouses are not part of most news reports.

Lab-grown animal products could and should end the historical practice of humans putting an almost endless amount of animals in small cages for a life of continuous misery which ends with their slaughter, that is the story news outlets should tell to humankind. It could be one of the most inspiring stories of the 21 century. Harmless meat and dairy products could start a new era of consumption with compassion. I think the evolving industry should insist on telling this story without fear of rejection. They may say we are dreamers, but we are not the only ones, I hope someday all humanity will join us and the world will be as one.

### About the author:

**Nick Kolyohin** is a correspondent working with an international news agency.

His stories are published in various outlets around the world, like MSN, Global Times, The Manila Times, China Daily, Big News Network, Namibia Press Agency, News Ghana, Daily Finland, and more.



# GSAP ACCELERATES DEVELOPMENTS IN THE FOODTECH INDUSTRY

The FoodTech industry is rapidly evolving with a variety of products emerging on the development landscape and some overcoming the quality and regulatory hurdles to reach the consumer market. With regulations and guidance changing rapidly, it requires a concerted effort to keep track.

**Gsap's broad expertise in the development of cell-based, biotechnology and pharmaceutical products, quality, animal testing and regulation, is a significant advantage in assisting our clients in this novel industry.**

## Gsap supports the following FoodTech areas:

Cultured meat

Alternative proteins

GMO (plant, bacteria and yeast)

GMO for poultry farming

## GSAP OFFERS THE FOLLOWING SERVICES FOR THE FOODTECH INDUSTRY:

### REGULATION

#### Product evaluation, regulatory strategy and GAP analysis

#### EU

- Initial assessment of the "novelty" of a food
- Collect information to support significant degree of consumption
- Risk Assessment
- Novel food consultation procedure
- Preparation of novel food dossier
- Post-submission support

#### US

- Assessment of GRAS eligibility
- GRAS Notice preparation
- Safety Assessment
- Hazard Analysis & Critical Control Point (HACCP) system
- Preparation for FDA/USDA inspections
- Food Additive pre-petition consultation
- Preparation of Food Additive Petition (FAP)

### QUALITY

#### Development/Manufacturing/Quality Assurance and Quality Control

- QA and QC systems establishment
- Bio/analytical assays development and validation
- Process transfer to GMP and scale up

### PRE CLINICAL

#### Animal/Human Studies

- Toxicological file preparation
- Planning animal studies



## CONTACT US

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## Optimization of Resources

In recent years, the food industry reached an understanding that land is not unlimited. Cattle raising uses resources that could be better used, and weather changes and spread of deserts require groundbreaking solutions for the development of controlled means of production for food. Moreover, consumers have higher demand for "healthy food"- with minimal (or zero) adverse effects on metabolism and microbiome.

Optimization of resources has become a major goal. For example, growing beet for the purpose of being used as food color is a waste of agricultural resources (land, water, fertilizers etc.), and its growth depends on climate and geography. Production of the same product by cultivation in a fermentor (agro-fermentation) is significantly more controlled, efficient and much less resource-consuming.

A second example, extracting low calorie sweeteners from plants is also a highly climate and geography dependent way of production, and separating the product from unwanted ingredients is also a challenge. Biosynthesis enables production of the product of interest, pure and uniform.

AMMY Bio develops biotechnological processes to produce products that are currently sourced from plants or animals, using different microorganisms as hosts for the expression of the products. These include microbial, yeast, fungi and algae. Host is selected per each product.

AMMY Bio is an entrepreneurial company, founded and is managed by veterans of the industry. Since its foundation in 2018, it has established a portfolio of products in different development stages.

AMMY-Bio develops its products in partnership with other industry players, either funding organizations or manufacturers.

### Areas of activities:

- Low calorie and low GI sweetener.
- Flavors & Fragrances
- Food additives and components

### Current portfolio:

- Food grade collagen production in algae (to replace sourcing from animals)
- Food color (to replace sourcing from insects)
- Giberellins (to replace sourcing from plants)
- Low calorie sweeteners (to replace sourcing from plants)

### About the author:

#### **Yacov (Yaki) Shpernat, MBA,**

is the Managing Director of AMMY Bio. Yaki has 20 years experience in managing small companies, emerging technology ventures and business units, 15 years as business development manager of a fine chemical company. He holds interdisciplinary knowledge in the fields of Chemistry, Engineering, Biotech, and Material science, and has extensive experience in industrial projects.

Contact: [yakis2@gmail.com](mailto:yakis2@gmail.com)



## Northern FoodTech of Israel presents novel alternative proteins

The meat and dairy industries have a disproportionate share of land use, and are responsible for water depletion and other environmental pressures. Tel Hai food science department and its researchers are facing these challenges with various solutions for alternative proteins:

### Moringa Oleifera

Plant-based milk alternatives are a fast-growing segment with more positive economic and environmental impact compared to conventional cow's milk. However, most of the plant-based milk alternatives available today have low protein content, contain allergens and have poor sensorial acceptability. Moringa Oleifera plant was examined as a sustainable softwood tree, with a rich source of nutrients like proteins, fibers, antioxidants, vitamins and minerals.

Our results demonstrated the high nutritional value of M. Oleifera leaves and seeds. We managed to produce concentrated powders with around 60-70% protein content. The leaf protein concentrate was found to be a strong emulsifier due to its high charge and solubility. The seed protein concentrate showed stable foaming capability and highly hydrophobic surface.

### Quinoa (*Chenopodium quinoa*)

Quinoa is one of the most promising novel candidates for plant-based meat replacement. Its seeds have a high protein content (approx. 14%),

contain all the essential amino acids (EAAs), harbor many health-promoting traits, and are gluten-free. Its world average grain yield is 2.5–3.5 t/ha.

We managed to develop an optimized extraction process for protein concentrate powder of 70% purity called QPC. The next step was to modify the QPC protein structure into fibril formation to promote better fibrous meat like structure and higher water holding capacity.

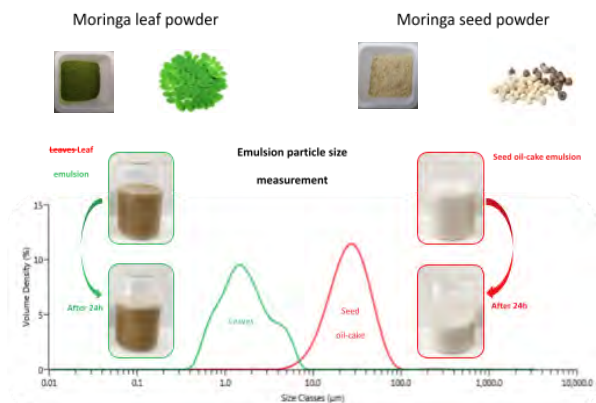


Fig 1. Moringa emulsion from leaf (left) and seed (right) protein concentrated powders

#### About the author:

**Dr. Ofir Benjamin** – Senior lecturer and researcher, food science department, Tel Hai College



## Alternative proteins: an industry disruptor

Consumption of plant-based proteins has been booming over the past few years, further fueled by the pandemic. As an example, Beyond Meat, the market leader in plant-based meat, saw its revenues grow at a compound annual rate of 115% during the period 2018-2020. Growth in consumption of alternative proteins is expected to continue, and different estimates of market future CAGR for the next 5-6 years are in the order of 7%-10%.

This increase stems mostly from the consumption by the large group of flexitarians, those who reduce, but not eliminate, their consumption of animal-based proteins. Hence, the plant-based protein industry poses significant challenges to the animal-based one.

The reason for this growth in consumption is fourfold. First, the environmental hazards associated with animal-based protein. Second, the growing need to conserve water and land. Third, the health hazards associated with animal-based proteins, such as the increased probability of cardiovascular disease and type-2 diabetes. Last but not least, the growing awareness to the suffering of animals and the demand for cruelty-free alternatives.

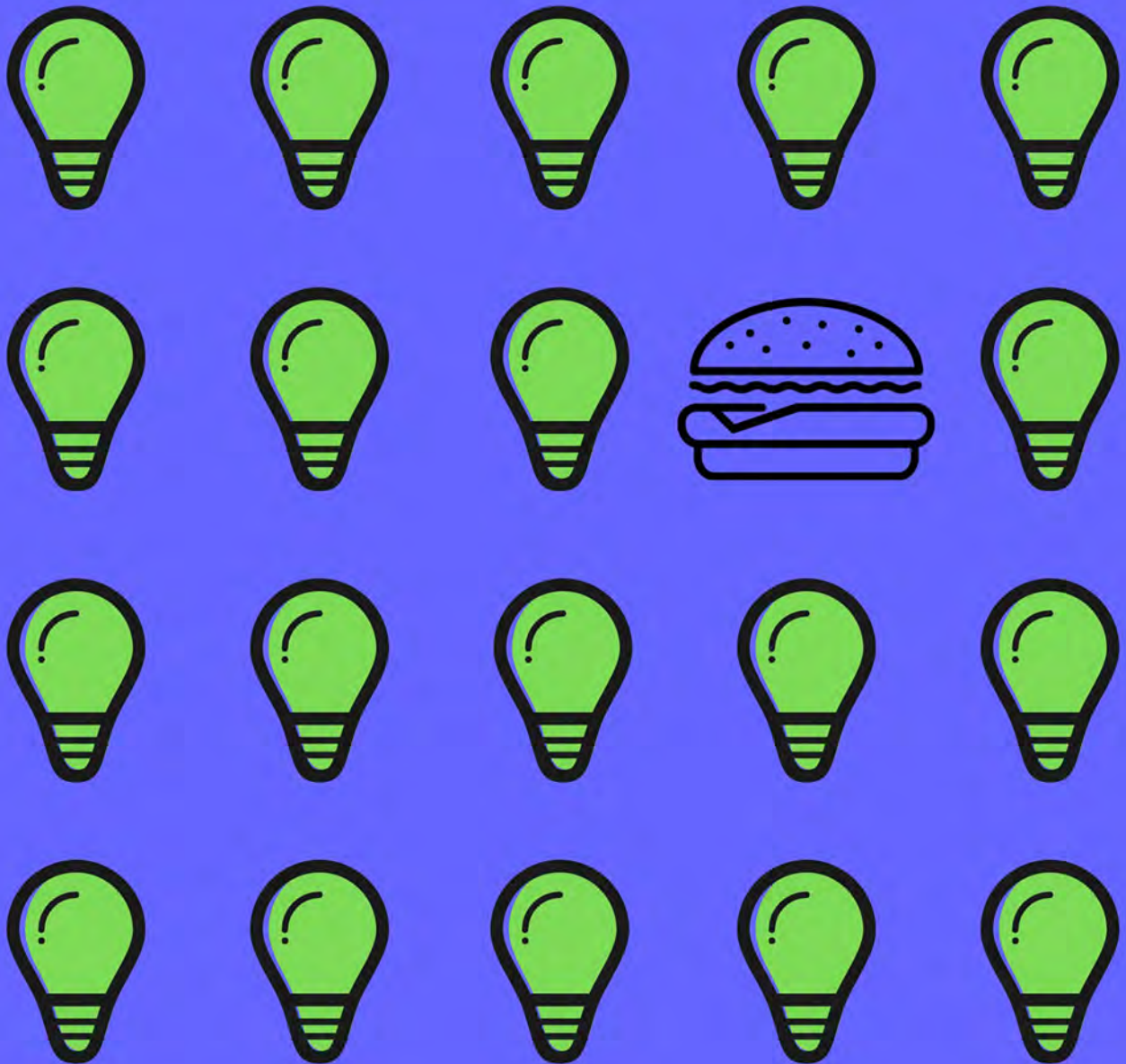
Naturally, the increased consumption of plant-based protein products goes hand in hand with an increase in the number of companies operating in the field as well as with an increase in investment. Early backers of the alternative protein industry, recognizing the industry's market potential and its role in promoting sustainability, include high tech moguls and financiers such as Bill Gates of Microsoft, Sergey Brin of Google and Richard Branson of Virgin, as well as entrepreneurs and philanthropists such as Jeremy Coller. The former set a concrete goal for meat consumption: "I do think that all rich countries should move to 100% synthetic beef".

Investment in alternative proteins reached a record high of \$3.1 billion in 2020, three times more than the amount raised in the previous year, according to the Good Food Institute. Of this amount, \$700 Million was raised by Impossible Foods, one of the largest private companies in the space. It should therefore not come as a surprise that the company is exploring the possibilities for going public over the next twelve months, either through an IPO or through a merger with a SPAC. Indeed, its CEO, Patrick Brown, said: "I think people are increasingly aware plant-based products are going to completely replace the animal-based products in the food world within the next 15 years."

**Prof. Shlomith D. Zuta**

School of Management and Economics  
The Academic College of Tel Aviv-Yaffo





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## ישראל מזהה את ההזדמנות להובלה עולמית בתחום החלבונים האלטרנטיביים

נועה יפה (פיתוח עסקי, זירת הזנק), רונית אשל (אסטרטגיה, זירת ייצור מתקדם)

אחת התעשיות הגדולות המשפיעות על משבר האקלים בעולם היא ענף המזון מן החי. מעבר לפגיעה המוסרית בבעלי החיים, התעשייה אחראית על כ-15% מפליטות גזי החממה וכרבע מזיהום המים המתוקים בעולם (!) בנוסף תעשייה זו היא הגורם המשמעותי ביותר לשימוש בקרקעות שהולכות ואוזלות. למעלה משליש מהיבולים בעולם משמשים להאכלת בעלי חיים, בעוד ש-820 מיליון בני אדם ברחבי העולם סובלים מרעב והמספרים האלו רק הולכים ועולים.

סיבות שונות ומגוונות אלו, הובילו את האדם לחפש תחליפי מזון בעיקר לבשר וחלב. הצורך לאתר ולפתח מזונות חדשים בעלי השפעה סביבתית מופחתת וצריכה אנרגטית נמוכה, תפס בשנים האחרונות תאוצה.

על פי מחקר שהתפרסם ב [Crunchbase](#), שוק התחליפים למזון מן החי הינו מהצומחים ביותר בעולם והוא צפוי להגיע לגודל שוק של 290 ביליארד דולר עד לשנת 2035.

גם בישראל, תחום החלבון האלטרנטיבי צובר תאוצה עם פעילות יזמית נמרצת המבוססת על יסודות של חדשנות טכנולוגית, מדע ומחקר. כיום קיימות בישראל מעל ל-100 חברות העוסקות בתחום. 40% מהן נחשבות לחברות סטארטאפ המפתחות טכנולוגיות חדשניות בעלות פוטנציאל לעצב את עתיד התזונה האנושית בעולם.

סכום ההשקעות בחברות חלבון אלטרנטיבי צמח פי שמונה בשנים האחרונות והגיע עד 114 מיליון דולר בשנת 2020.

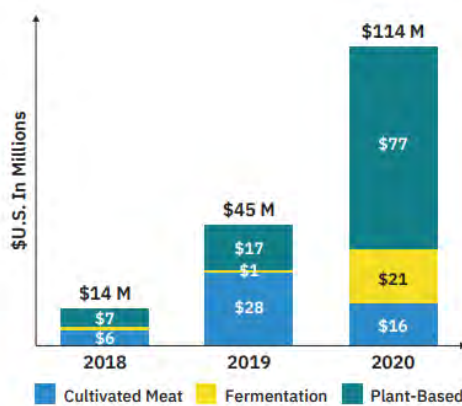


Figure 2.5. Startup fundraising by alternative protein sector in millions of USD (2018-2020).



\* מתוך הדו"ח של GFI 2021

לישראל ההזדמנות להיות מובילה עולמית בתחום החלבונים האלטרנטיביים, ורשות החדשנות, המופקדת על מדיניות החדשנות, מעודדת פעילות חברות לאורך הדרך כחלק מאסטרטגיה מקיפה לטיפול וקידום תחום טכנולוגיות האקלים בישראל.

תפקיד הרשות לקדם את משאב החדשנות בישראל, תוך יצירת תשתיות עבור תעשיית ההיי-טק, ובדגש על הטמעת חדשנות בתעשיית הייצור. תמיכה זו נעשית באמצעות מענקים לחברות משלב הרעיון הראשוני או ממחקר באקדמיה, דרך הקמת סטארטאפים וחברות צומחות ועד להקמת קו ייצור חדש בישראל!

אחת הפעילויות המשמעותיות שאנו מובילים בתחום הפודטק היא מסלול החממות ומסלול מעבדות. במסגרתם קיימות ארבע חממות ומעבדות, בתמיכת הרשות, אשר מלוות יזמותים וחברות בתחילת דרכם. החממות שמופעלות על ידי תאגידים גדולים כדוגמת שטראוס, תנובה טמפו ועוד, מסייעות ליזמותים המעוניינים להקים סטארטאפ על בסיס רעיון טכנולוגי חדשני, על ידי מתן מענקים ומסגרת תומכת להקמת החברה ופיתוח הרעיון לכדי מוצר מסחרי. לאחר הבשלת המוצר להעברה לייצור, חברות נתמכות על ידי מסלול "מעבר מפיתוח לייצור" ובו מפותח תהליך הייצור ההמוני להקמת קו ייצור בישראל.



לדוגמה, חברת Redefine Meat אשר חשפה את מוצרי ה-Alt-Steak הראשונים בעולם מיצור תעשייתי דיגיטלי המבוסס על רכיבים מהצומח והמיוצרים באמצעות טכנולוגיה חדישה המוגנת בפטנטים. למוצרים של החברה מרקם, טעם ומראה של בשר מסורתי והם שואפים לייצר את החוויה הקולינרית המושלמת.

החברה קיבלה רצף תמיכה מקיף מרשות החדשנות, הכולל מענק תמיכה לפיתוח המוצר במסלול חברות מתחילות ועד למענקים להקמת קו ייצור במסלול מעבר מפיתוח לייצור מתקדם. בשנת 2021 הודיעה החברה כי השלימה סבב גיוס A בסך 29 מיליון דולר.

"אישור המענקים של רשות החדשנות העניק לנו חותמת איכות ואמון מול משקיעים נוספים בחברה. בעזרת אישור זה הצלחנו לגייס את הסכום הנדרש להקמת מתקן ייצור רחב היקף בישראל" - אומר אשחר בן שיטרי, מנכ"ל ומייסד שותף של החברה.

כרגע נמצאת החברה בתהליך מעבר ממתקן פיתוח למתקן פיילוט לייצור מסחרי, ועתידה לפתוח מפעל באזור פיתוח א' במהלך 2022.

לצד חברות המפתחות פתרונות לתחליפי בשר, יש גם מי שחולמים שכלל המזון מן הטבע יהיה מיוצר בדרכים שאינן פוגעות בבעלי-חיים; ביצים הן מצרך בסיסי וחיוני כמעט בכל העולם, אך כמו ברוב תעשיות המזון מן החי, גם תעשיית הביצים דורשת השקעה של ממוך, זמן ואנרגיה גבוהה, לצד גרימת סבל לתרנגולות. חברות רבות מנסות לגבש פתרון תזונתי שיהווה תחליף ראוי - בטעם ובערכים התזונתיים.



חברת Zero Egg הישראלית שקיבלה תמיכה מרשות החדשנות, ובוגרת של חממת דה קיטשן, מפתחת תחליף ביצה שיהיה ראוי בטעם, במרקם ובערכים התזונתיים. לחברה מוצרים כגון תחליף אבקתי, נוזל קפוא וחביתה קפואה מבוססי פורמולה ייחודית הכוללת חלבוני סויה, חומס, תפוח"א ואפונה. נוזל זירו אג מחליף ביצה שלמה במגוון של מנות כגון: חביתה, מקושקשת, וקיש, עוגה, עוגיות ופנקייקים. לירון נמרודי, מנכ"לית החברה מציינת כי "בנוסף ליתרונות התזונתיים של המוצר, השימוש בזירו אג מסייע לשמירה על כדור הארץ בכך שהוא מאפשר

חסכון של יותר מ-90% מהאנרגיה, בשטחי גידול ומים המושקעים בגידול תרנגולות לביצים, וחסכון של כ-60% מפליטת גזי החממה!" לאחרונה השלימה החברה סבב גיוס בסך 5 מיליון דולר והחלה בתהליכי העברה לייצור בישראל, תחת מסלול מופ"ת, לפיתוח מוצרי ביצים מוכנים לשימוש מידי.

בישראל מתפתח אקו-סיסטם מוביל בתחום החלבון האלטרנטיבי, רשות החדשנות פועלת לאפשר ולמצב את מדינת ישראל כמובילה עולמית טכנולוגית בסקטור זה. ד"ר מלכה ניר, ראש זירת ייצור מתקדם ברשות החדשנות, מתייחסת לתוכניות עתידיות לקידום הפודטק בישראל: "זיהינו את ההזדמנות לפתח את ישראל כמובילה עולמית בתחום החלבון האלטרנטיבי, ולקדם הקמת קו ייצור בטכנולוגיה מתקדמת. אנחנו שמחים לראות יותר ויותר חברות מתנסות בפיתוח מוצרים ומבשילות עד כדי שלבי הייצור. תמיכה בתוכניות מופ"ת מהווה נדבך מרכזי בפעילות רשות החדשנות בפיתוח ענף הפודטק, לצד השותפות בקידום האקוסיסטם בצפון, כולל הקמת מכון מזון".



betterair

## Alternative protein production by fermentation – Scaling up challenges and insights

Alternative proteins are produced by plants, cultivated meat, and by fermentation. The latter is considered the most efficient, sustainable and rapidly emerging technology.

Microbes can double their biomass within hours, while consuming simple and inexpensive agro-industrial byproducts. Their biomass can contain over 50% protein, making microorganisms the key source for novel alternative proteins.

Increasing the protein yield as well as designing continuous fermentation processes will raise the productivity, however, the most significant bottleneck is scaling up.

### **Fermentation processes scale up can be successful if three guidelines are followed:**

- Have a clear vision of the final construction.
- Pay close attention to details.
- Expect the unexpected.

The laboratory developed process (0.5-10L fermentors) must be scaled up to mass production (20,000–2,000,000 L fermentors) in order to be profitable. To minimize risks, scale up is preferably done through two intermediate stages: pilot scale and demo scale.

The core challenge of industrial microbiologists is understanding how scale-dependent parameters change and affect microorganisms with the increase from lab scale conditions to industrial scale. There are many parameters that impact performance, most of them are subject to change during scale-up. Therefore, fermentors' geometry and configuration similarities must be maintained.

The initial guideline is to scale down and validate scale-dependent fermentation parameters that mimic as close as possible the intended large-scale manufacturing process.

The main critical scale up parameters include agitation and aeration rates that affect the mass transfer, shear stress, broth hydrostatic pressure, and duration of sterilization.

Another scale related aspect is selecting a microbial host which should be suitable for large scale production.

Initial collaboration between R&D scientists and scale up engineers from the first day of the project, will ensure a smooth transition to the large-scale production plant.

### About the author:

**Moti Rebhun PhD**, an industrial microbiologist focused on microbial physiology and fermentation technology, experienced in R&D, production and commercialization of microbial based products. Dr. Rebhun is the co-founder and CEO of the Israeli Fermentation Association and is the CTO of Better-Air, a pioneering company in the indoor bio-cleaning arena.



## Are you part of a FoodTech company and planning to enter international markets?

R.S. NESS can support you in the following fields:



### Quality Assurance (QA)

Are you planning to enter the company into the emerging industry and becoming a larger player, which includes increasing control and quality, required for most of the international markets?

**R.S. Ness can support with the following:**

- Planning and Establishing a quality system "tailor made" to fit your companies evolution.
- Improving the quality system.
- Supporting audits (internal and external), preparations and online support (attending and/or managing)
- Routine management of QMS elements including risk mgmt.



### Validation

Are you part of a manufacturing company planning to increase the production capacity (Scale-Up)? Are you planning to build a manufacturing plant or modify an existing production process? DO you plan to submit you product to regulatory authorities?

**R.S. Ness can support with the following:**

- Planning your testing/ qualification strategy
- Facility/Utility/Equipment qualification (IQ/ OQ/ PQ)
- Process Validation
- Computerized System Validation (CSV)
- Test Method Validation (TMV)

### Regulation

Has your concept been proven and now the plan is to move forward with submitting to Europe and/or the USA? There are many regulatory aspects related to FoodTech Industry that require compliance before marketing in this regions (e.g. FDA, USDA).

**R.S. Ness can support with the following:**

- Regulatory strategy establishing
- Communication with regulatory authorities
- Design and development support from a regulatory perspective



### Engineering

Are you in the process of planning to proceed from development to production or are you a manufacturing company increasing production capacity (Scale-Up), or modifying an existing production process, or even planning to build a manufacturing plant.

Characterization and planning of the processes, equipment, utilities, and facility are the keys to success in manufacturing processes as well as compliance with relevant regulatory requirements.

**R.S. Ness can support with the following:**

- Utility/Equipment engineering design
- Facility layout design
- Process development



### Project Management

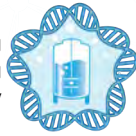
As part of your overall facility and engineering projects, such as process development, scale-ups, facility upgrades, integrations etc.

**R.S. Ness can support with the following:**

- Project Management & consulting services
- Stakeholders representative services - Managing processes on behalf of the stakeholders, from the early project stages and with all types of negotiations and project management (Engineering, Construction, LSTK, EPCM).

RS NESS provides an umbrella of services to the Life Science industry in numerous lifecycle stages, incorporating end-to-end project activities, while adhering to the regulatory requirements. Knowledge, professionalism, and hands-on dedication lead our highly qualified teams to the mutual goal of your success.

האגודה | The Israeli  
הישראלית | Fermentation  
לפרמנטציה | Society



## The Israeli Fermentation Society

Fermentation has been a part of humanity since ancient times with alcohol and vinegar production being around for thousands of years. However, the first industrial fermentation process was developed by Dr. Chaim Weizmann at the beginning of the last century. A research team led by Dr. Weizmann in Great Britain during the First World War developed a process for the production of acetone by fermentation, which led to the development of the first large-scale fermentation vessels.

Weizmann used the *Clostridium acetobutylicum* bacterium to produce acetone that was eventually used in the manufacture of cordite explosive propellants, critical to the Allied war effort. In recognition of Dr. Weizman's contribution to the war effort, the British government issued the Balfour Declaration that eventually led to the establishment of a Jewish state in 1948. Chaim Weizman was appointed Israel's first President.

Since then, the global fermentation industry has expanded considerably, leading to the development of organic acids, antibiotics, enzymes, microbial biomass, monoclonal antibodies, heterologous proteins, and biopharmaceuticals. Today, the Israel life-science industry is at the forefront of the latest biotechnological developments, many of which are based on fermentation technology.

Alongside veteran companies such as Bio-Technology General (BTG), Protalix Biotherapeutics, Pluristem Therapeutics, Sigma-Aldrich & Merck Millipore, and Fermentek, dozens of new fermentation-based startups have been founded in recent years. Israel is ranked second in the world, after the USA, for the number of alternative-protein fermentation companies.

The Israeli Fermentation Society (IFS) is dedicated to strengthening the excellence of Israel's fermentation industry and to bringing together academia and industry. The country's top universities and colleges, together with its world-famous startup entrepreneurial spirit, provide the basis for bringing to market new fermentation-based technologies and products.

Following the Seminar on "Protein Fermentation in Israel" together with the Weizmann Institute and the Good Food Institute at 2020, the IFS will hold its annual meeting on July 8th, 2021 with key speakers focused on fermentation technology.

**For further details, please contact: [Israeli.fermentation.society@gmail.com](mailto:Israeli.fermentation.society@gmail.com)**



## ProteVin™ – the first complete vegan alternative to whey protein

Recognizing the two most significant shortcomings of plant proteins, namely: poor flavor and nutritional value, NextFerm have developed ProteVin™, the first non-GMO, vegan protein having neutral flavor, and a perfect PDCASS (digestibility) score of 1.00. Importantly, it has a whey-like amino acid profile, including: BCAA (Branched-Chain Amino acids) and EAA (Essential Amino Acids). That combination of properties and benefits have existed so far only in whey and other animal-derived proteins.

Furthermore, ProteVin™ is a product of yeast fermentation, and as such it carries several advantages of its own, including: highest degree of sustainability, cost-effectiveness of the process and product, short and robust supply chains, and an agile technology that can be improved over time due to the intrinsic properties of the yeast. Regulatory-wise, ProteVin™ is a baker's yeast (*Saccharomyces cerevisiae*) derived protein isolate, and as such there are no specific requirements for approval in the US and in many other territories.

The company is now scaling up and running a pilot stage while large multinationals and US-based brands are on the waiting list for material samples for further development of prototypes.

**NextFerm (TASE: NXFR) is an emerging food tech company that is leveraging in-house IP and know-how in the fields of non-GMO yeast improvement, fermentation, and downstream processing to develop and produce innovative food ingredients for human nutrition. The company is collaborating with large multinationals and has successfully launched Astaferm®, the first yeast-derived astaxanthin in the US market. The management team of NextFerm is comprised of veterans in the industry who had led a previous food tech company (Enzymotec) all the way from its early stages to a Nasdaq IPO (ENZY 2013).**



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Modern Agriculture Foundation  
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**Contact Details**



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# Alternative Proteins IL 2020

## Technology Seminar **November 26, 2020**

### 8:30 Seminar Opening

Opening words  
**Modern Agriculture Foundation**

8:40 **Prof. Yaakov Nahmias**  
**Future Meat Technologies, Tissue Dynamics, HUJI**  
 The Future of Food is Cellular

9:10 **Nir Goldstein**  
**Good Food Institute Israel**  
 The Good Food Institute and Resources for Advancing Alt Protein R&D

9:30 **Tamar Morag-Sela**  
**Reinhold Cohn Group**  
 Intellectual Property for Start-Up Companies

9:55 **Thierry Duvanel**  
**Bühler**  
 Novel plant-based meat using high-moisture extrusion processes – a case study on how Buhler accelerates their development

### 10:25 10 minutes break

10:35 **Dr. Tammy Meiron**  
**Fresh Start**  
 From BioTech to FoodTech and Back

10:55 **Yael Himmel Shlomo**  
**RS NESS**  
 Your FoodTech Compliance Roadmap

11:20 **Dr. Tzvi Zvirin**  
**BioBetter**  
 Tobacco Plant - a Sustainable Bioreactor for Production of Recombinant Proteins

11:40 **Gero Greive**  
**Bioengineering**  
 Bioreactors for Commercial-Scale Production: Planning Now for What Comes Next

12:05 **Matthew Robin**  
**ELSA-Mifroma Group**

### 12:15 Lunch Break

13:00 **Diana Gershtein**  
**Gsap**  
 Growing Alternative Meat Products with State-of-the-Art Cell Culture Techniques- Challenges & Restrictions

13:25 **Gali Artzi, Ph.D**  
**IFF**  
 Tasty Proteins - Key Characteristics of Product Development

13:45 **Ronny Reinberg**  
**Modern Agriculture Foundation**  
 Alternative Protein - Where are We Now? Where are We Heading?

14:05 Panel: **Dr. Tom Ben-Arye, Gali Artzi, PhD, Dr. Neta Lavon, Nitzan N. Ben Chaim**  
 Moderator: **Neta Rosenthal**  
**GFI, IFF, Aleph Farms, Innovopro, MAF**  
 Challenges, Opportunities and Trends in Food Innovation

### 14:30 10 minutes break

14:40 **Dr. Neta Lavon**  
**Aleph Farms**  
 Slaughter-Free Scalable Production of Beef Cuts

15:05 **Inbal Shaish, Ph.D**  
**Merck Israel**  
 From Bench to Fork – The Science Behind Cultured Meat

15:30 **Brian P. Sylvester**  
**Covington & Burling LLP**  
 US Regulatory 101 for Alt Protein Entrepreneurs

16:00 **Nitzan N. Ben Chaim**  
**Innovopro**  
 Innovopro – The Chickpea Protein Revolution

### 16:25 Closing remarks

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**Gali Artzi, PhD.**

VP Innovation and Clinical Affairs, NPS, IFF



**Brian P. Sylvester**

Special Counsel, Covington & Burling LLP



**Matthew Robin**

CEO, ELSA-Mifroma Group



**Tamar Morag-Sela**

Patent Attorney, Partner, Reinhold Cohn Group



**Diana Gershtein, M.Sc, MBA**

Advanced Therapies Section Manager, Gsap



**Thierry Duvanel**

Director of Collaborative Innovation, Bühler Group



**Gero Greive**

Head of Process Engineering, Bioengineering



**Yael Himmel Shlomo**

Director Of Regulatory Affairs, RS-NESS



**Inbal Shaish Ph.D, MBA**

Regional Sales Manager, Merck Life Science, Israel



**Prof. Yaakov Nahmias**

Founder & CSO, Future Meat Technologies



**Ronny Reinberg**

Executive Director, MAF



**Nitzan N. Ben Chaim**

CTO, Innovopro



**Dr. Tammy Meiron**

CTO, Fresh-Start Incubator



**Nir Goldstein**

Managing Director, The Good Food Institute Israel



**Dr. Tzvi Zvirin**

Business Development Director, BioBetter



**Neta Lavon, PhD**

Vice President of Research and Development, Aleph Farms



**Dr. Tom Ben-Arye**

Senior Scientist, The Good Food Institute Israel



**November 26, 2020**

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## **Prof. Yaakov Nahmias**

**Founder & CSO, Tissue Dynamics; Founder & CSO, Future Meat Technologies; Professor of Bioengineering, The Hebrew University of Jerusalem (HUJI)**

### **The Future of Food is Cellular**

Meat consumption has been a critical step in human evolution. Access to protein and fat allowed us to increase in numbers and develop a complex brain and cultural habits. This history of meat consumption is hard-wired in our cognitive and emotional response to the grilling of animal fat. However, a rapidly growing population and insufficient environmental resources currently limit our ability to expand animal agriculture to meet the rising demand in animal protein. In addition, animal farming is estimated to produce about 16% of the world's carbon emissions contributing to growing climate concerns. Recent developments in plant-based alternatives managed to realistically mimic the texture and mouth feel of meat, but the aroma and flavour of these new products is still lacking. Cellular agriculture is one technology capable of reproducing the distinct aroma and flavour of meat. While cellular agriculture can meet the increasing demand for animal products, the technology is currently limited by the need to genetically modify cells, low culture yields and high production costs. Here we present a novel technology produce immortalized animal cells without genetic manipulation, allowing the cells to grow in high density suspension cultures reaching production yields over 33% w/v. Cells are transdifferentiated to fat in animal-component free media providing the critical aroma and flavor of meat products. Visual and sensory analysis graded the product 4.5 out of 5.0, with over 85% percent of the study group saying they are extremely likely to replace their food choice with this cultured meat product. The ability to create immortalized lines without genetic modification, and the high yield process for cultured meat production presents an important steppingstone in the market realization of cultured meat.



## **Nir Goldstein**

**Managing Director, The Good Food Institute Israel**

### **The Good Food Institute and Resources for Advancing Alt Protein R&D**

The Good Food Institute is a global nonprofit promoting alternative proteins. Nir, the Managing Director of GFI's Israeli branch, will shed light on the need for an innovative food system, the different technological approaches, current trends and the 2030 forecast.



### **Tamar Morag-Sela**

**Patent Attorney, Partner, Reinhold Cohn Group**

#### **Intellectual Property for Start-Up Companies**

A business plan for creating a sustainable revenue stream heavily depends on a company's Intellectual property (IP) and strategizing around different intellectual property, such as patents, trademarks and trade secrets, is the key to drive growth and maintain a competitive edge in the marketplace. In the modern economy, IP has evolved to be a key factor in a company's chances of success and in order to build an IP that provides a commercial value, there is a need for a good planning ahead, an on-going knowledge of the potential competitors and smart budgeting, already from Day 1. "Know your enemy, know yourself, and victory is never in doubt" [The Art of War (Chapter 3) San Tsu, 5th century BC]



### **Thierry Duvanel**

**Director of Collaborative Innovation, Bühler Group**

The Bühler Group is a leading solution provider across the whole protein value chain. From soy, oilseed, pulse to upcycling side streams or newer ingredients like microalgae, we are leading the way in developing sustainable alternatives to meat. We share our global experience in local application centers worldwide, where we accelerate customer ideas and scale it from lab scale to industrial solutions.

In this presentation we will share the experience of the valorization of side streams for new meat analogues and how we collaborate with startups, industrial partners and science to provide you with the best services.



### **Dr. Tammy Meiron**

**CTO, Fresh-Start Incubator**

#### **From BioTech to FoodTech and Back**

Welcome to a world of technology conversion; from biotech to foodtech and vice versa.

This 20-minute talk by Dr. Tammy Meiron is based on personal experiences, real stories & case studies that will reveal challenges & opportunities in this fast-growing arena.



## **Yael Himmel Shlomo - Director Of Regulatory Affairs, RS-NESS**

### **Your Foodtech Compliance Roadmap to FDA approval**

You've developed an impressive Technology that produces the tastiest and healthiest food, now the big question is how do you get from here, to an FDA regulatory approval?

During this presentation, we will go through the basic steps and roadmap required for FDA Compliance, from an end-to-end project view, as well as review key requirements and Best Practices for the Strategy, Manufacturing, and Testing Phases, leading eventually to the desired FDA submission package and process.

Whether you are aiming for GRAS exemption, developing a novel hybrid protein, or working on the next cell-cultured meat technology, this roadmap will help you to become aware of what lies ahead, and prepare accordingly in order to enable accelerating time-to-market.



## **Dr. Tzvi Zvirin - Business Development Director, BioBetter**

### **Tobacco Plant - a Sustainable Bioreactor for Production of Recombinant Proteins**

BioBetter has developed a disruptive technology for manufacturing of complex recombinant proteins. Its revolutionary platform technology using tobacco plants dramatically simplifies and reduces the production costs of recombinant proteins. BioBetter technology is green and ecological - it mainly requires sun, soil and water to facilitate the production of the biologic drug using a stable plant production system, expressing the protein in the whole plant. BioBetter's bioreactors do not require electrical power, do not produce CO2 emissions and dangerous waste production. On the contrary, these bioreactors are sustainable, absorb CO2 and release Oxygen to the atmosphere and produce small amounts of organic waste that can be reused as fertilizer.



**Gero Greive - Head of Process Engineering, Bioengineering**  
**Bioreactors for Commercial-Scale Production: Planning Now for What Comes Next**

The presentation is focused on bioreactor design and processing as one of the largest barriers to commercializing cultivated meat.

Whether scale-out or scale-up, the selection of an appropriate pilot-scale bioreactor is essential in order to shorten timelines and avoid duplication of efforts in the mid to long-term.

Based on a case study from the industry and nearly 50 years of experience manufacturing biopharmaceutical plants, we will discuss design considerations for a pilot train for market testing.



**Matthew Robin – CEO, ELSA-Mifroma Group**



**Diana Gershtein, M.Sc, MBA - Advanced Therapies Section Manager, Gsap**

**Producing Alternative Meat Products with State-of-the-Art Cell Culture Techniques: Challenges & Restrictions**

In the past few years, the landscape of cell-based products and applications has quickly evolved; challenging the regulatory and quality policy makers to come up with unique requirements for each novel product class. In order to build product and process-specific strategies, the industry is expected to interpret the existing guidance as well as employ established industry best-practices to address known safety concerns with the relevant adaptations. Risk assessment has become the key driving force for novel product development. This talk will cover the points to consider when building a controlled production process, map challenges known from the cell-based product industry, and illustrate their relevance for alternative meat production.



## **Gali Artzi, Ph.D - VP Innovation and Clinical Affairs, NPS, IFF**

### **Tasty Proteins - Key Characteristics of Product Development**

With an increased focus on sustainable, healthy and ethical food choices, more consumers than ever are choosing to include plant-based protein as part of their diet. As these proteins don't perform in the same way as their traditionally processed, animal-based counterparts, it is an enormous challenge to create a "meat like" experience with plant-based proteins in appearance, color, texture, processing behavior, taste and smell.

In order to develop a great-tasting plant-based product, new flavoring technologies and different approaches are required. Based on a combination of future trends analysis, consumer insights, and a modernized cross-category development process, IFF tailors its capabilities to meet the fast-growing consumer trend to 'swap' to plant-based proteins and pioneers technologies that support alternative and sustainable food sources without compromising great taste.



## **Ronny Reinberg- Executive Director, Modern Agriculture Foundation**

### **Alternative Protein - Where are We Now? Where are We Heading?**

In my talk, I will highlight some of the current trends within the Alternative protein space in Israel and around the world, as well as point out the biggest challenges the AP industry will face in the upcoming years.

As a scientist with years of experience in the pharmaceutical industry, I call my fellow scientists from the various life science practices to join us in promoting the next modern agricultural revolution - "the Alternative Protein revolution".



## **Dr. Tom Ben-Arye**

### **Senior Scientist, The Good Food Institute Israel**

Dr. Tom Ben-Arye is a Senior Scientist at GFI Israel. He developed a cultivated meat technology in the Technion University, which led to the creation of a start-up company called Aleph Farms and was published in Nature Food. He also provides 3 academic courses on alternative proteins in The Hebrew University of Jerusalem, Tel-Aviv University and Ben Gurion University.





### **Neta Lavon, PhD - VP R&D, Aleph Farms**

#### **Slaughter-Free Scalable Production of Beef Cuts**

The increasing consumer demand for meat and the limited resources available to answer it, force food systems to seek out sustainable ways to produce meat products in scale, where and when they're needed.

At Aleph Farms, through the process of identifying the composition and structure of whole beef cuts, we combine a nature-inspired design with technology, to enable the scalable production of meat products, without the downsides of the meat industry. By understanding the precise functions and properties of ingredients, we are able to formulate the desired attributes of our products. We use non genetically modified cells collected from cows, without slaughter, from which we establish cell banks that serve as an unlimited source for reproducible meat batches. Our Unique technology uses a closed system to grow various cell types in 3D, under controlled conditions, and provides the full sensorial experience of whole beef cuts.



### **Inbal Shaish Ph.D, MBA - Regional Sales Manager at Merck Life Science, Israel**

#### **From Bench to Fork – The Science Behind Cultured Meat**

By 2050, estimates suggest that the number of people on the planet will have reached 9.7 billion, and the demand for meat and milk will grow by a staggering 70%. It is now well understood that our taste for animal protein comes at a huge environmental cost: an astonishing 60% of global biodiversity loss, greenhouse gas emissions driving climate change, as well as ethical considerations involving animal suffering. Eliminating the need to breed, raise and slaughter animals for food, clean meat offers a way to reduce agricultural greenhouse gas emissions by up to 96%, using 99% less land, up to 96% less water, and can also offer additional health benefits, such as extra nutrients or fewer contaminants like antibiotics, pathogens or microplastics. As a leader in the life science industry, Merck is positioned to become the leading technology provider to the clean meat industry, with extensive knowledge of the relevant science and biotechnology that are required to produce clean meat.

We are working closely with a broad range of partners across different sectors, including academia, start-ups, non-profits and large corporations, offering reagents and equipment needed for the upstream process for growing cells, such as media, growth factors, animal-origin free formulations, stem cell lines, monitoring tools, bioreactors, etc. We are also interested in helping to find solutions to cutting-edge technologies such as edible scaffolds and 3D printing, that hold the potential to develop the next generation of structured products.



## **Brian P. Sylvester - Special Counsel, Covington & Burling LLP**

### **US Regulatory 101 for Alt Protein Entrepreneurs**

Food tech entrepreneurs perform best when they incorporate regulatory considerations into their product development strategy early and often. Different countries have adopted different stances on how various alternative protein products fit into their existing food regulatory frameworks. Today's presentation will provide a high level overview of key US regulatory considerations for producing alternative proteins using plant, microbial and animal cell-based technologies. We will consider how existing US laws apply to various alternative proteins, recent regulatory developments, and certain unique challenges facing cultured meat producers, in particular.



## **Nitzan N. Ben Chaim - CTO, Innovopro**

### **Innovopro – The Chickpea Protein Revolution**

Innovopro has developed a sustainable, innovative solution that meets the world's need for new protein sources. We have a proprietary technology to produce a chickpea protein powder which contains 70% protein. Our product is environment-friendly in many aspects, and highly applicable in different food products. Due to the neutral taste and colour, emulsification and additional functional properties, it can replace artificial additives and create clean label formulations.

At the same time, the chickpea protein developed by Innovopro is offering a solution to the current growth in demand for proteins in general and plant-based sources in particular.

Just a few weeks ago, the World Food Program was awarded the Nobel Peace Prize for its efforts to combat a surge in global hunger amid the coronavirus pandemic. This winning expresses best where the world is heading:

The pandemic had stressed the challenges of food security. Countries are forced to look for local, affordable and sustainable food resources.

We are committed to contribute our share in providing local businesses by sourcing, producing and selling healthy, tasty and sustainable solutions for future generations.



Interested in sponsoring, speaking or exhibiting at our next event?

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Contact us: [neta@modern-agriculture.org](mailto:neta@modern-agriculture.org)



**Modern  
Agriculture  
Foundation**  
העמותה לחקלאות מודרנית (ע"ר)



MAF is an Israeli non-profit organization set out to transform global food culture by replacing traditional animal-based foods with cultured meat, fermentation-based products and plant-based alternatives.

## Innovative, Sustainable Food



### MAF Vision

The Modern Agriculture Foundation (MAF) envisions a food system in which healthy, sustainable and affordable food is produced without harming public health, animals or the environment.



### MAF Mission

We foster high-impact innovation;  
We rally a community of scientists, entrepreneurs, investors, industry leaders and government decision-makers;  
We connect and nurture the ecosystem;



### Achievements

- Initiated and funded a cultivated chicken feasibility study in Tel Aviv University
- Supported the pre-seed funding round of the world's second cultivated meat company and the first cultivated poultry company
- Advanced the inception of additional cultivated meat start-ups
- Received the Outstanding Award for Innovation and Sustainability from the Israeli Forum for Sustainable Nutrition (2017)
- Created and organized the first cultured meat conference in Israel
- Organized Israel's first Alternative Proteins technology seminar
- Laid foundations for and supported the creation of Switzerland's first non-profit dedicated to promotion of alternative proteins, Food Visionaries

### Major Program Activities

- Mapping Israel's Alternative Protein landscape
- Planning and promoting the creation of the world's first dedicated industrial scale Alternative Protein products manufacturing site
- Supporting, nurturing and growing new Alternative Protein start-ups
- Building and leading the local Alternative Protein community
- Initiating and leading the first Alternative Protein Foodtech Accelerator in Israel

## Changing FOOD for GOOD



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# הכנס ההיברידי הגדול של הפודטק בצפון



חמישי | 24.6.21 | LIVE | המכללה האקדמית תל-חי

הצגת פיתוחי  
מוצרים של  
הסטודנטים



הצגת חברות  
פודטק מהצפון



מושב יתרון  
המשלבים מחקר  
אקדמי והתעשייה



## מושב פודטק צומח בצפון 10:45

יו"ר מושב: ניסן זאבי, Head of business development, Margalit Startup city Galilee

הצגת 3 מיזמי פיתוח מוצרים של הסטודנטים בחוג למדעי המזון

### הצגת חברות פודטק צפון:

יובל קליין, Blue-Tree

טל לוצקי, Pigmentium

נועם פתחה, Peas of Bean

ד"ר מאיר שליסל, NutriLees

עמיקם בר-גיל, Vemoja

## ארוחת צהריים 12:00

ארוחת צהריים וחשיפת פיתוחי המוצרים של הסטודנטים

Speed Date עם פגישות קבועות מראש עם נוכחי הכנס בLIVE ובמקוון

## התכנסות, כיבוד וקפה 9:00

## דברי פתיחה וברכות 10:00

ד"ר אופיר בנימין, יו"ר הכנס, המכללה האקדמית תל-חי

פרופ' יוסי מקורי, נשיא המכללה האקדמית תל-חי

מר דוד זיגדון, מנכ"ל מיגל – מכון למחקר מדעי בגליל

פאולה פיטסני, ראשת החוג למדעי המזון

גליה שגיא, מנהלת איגוד תעשיות המזון,

התאחדות התעשייתיים

## הרצאות אורח 10:20

אניה אלדן, סמנכ"ל רשות החדשנות

שת"פ פרטי-ציבורי לבניית אקו סיסטם של פודטק

דידיה טוביה, מייסד ומנכ"ל Aleph Farms

בשר מתורבת כאבן פינה של תעשיית מזון גלובלית בת קיימא

| 14:00 |

## שלושה מושבים במקביל:

### חומרים מן הטבע לשימוש במזון

יו"ר מושב: פרופ' זהר כרם

ד"ר לואי בשיר, החוג למדעי המזון, המכללה האקדמית תל-חי

ד"ר דורית אבני,

חוקרת ראשית, מיגל

פרופ' זכריה מדר, הפקולטה

לחקלאות, האוניברסיטה העברית

Prof. Jan Delcour, Leuven University, Dean food science department

### פודטק ותעשיית המזון סיכום שנת קורונה

יו"ר מושב: ניצן סלע-בלום,

מנהלת Startup Studio Galilee Margalit Startup City

נגה סלע שלו, סמנכ"לית פיתוח

עסקי, חממת Fresh Start

גופנה ליס-רובין,

מנהלת Open Innovation

Osem-Nestle Israel

רועי וייזר, סמנכ"ל שיווק ופיתוח

עסקי, סוגת - מלח הארץ

אילנית קבסה, Venture Partner

NovoProteins by Novozymes.

Advisor, Dole

### חלבון אלטרנטיבי

יו"ר מושב: ד"ר תמי מירון, CTO,

Fresh Start FoodTech Incubator

ד"ר תום בן אריה, מדען GFI ישראל

פרופ' מרסל מחלוף, דיקנית

הפקולטה להנדסת ביוטכנולוגיה

ומזון

פרופ' תמיר טולר, אוניברסיטת

תל-אביב

ד"ר אופיר בנימין, החוג למדעי

המזון, המכללה האקדמית תל-חי



The Modern Agriculture Foundation (MAF) is an Israeli non-profit organization set out to transform global food culture by replacing traditional animal-based foods with cultured meat, fermentation-based and plant-based alternatives.

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#### Disclaimer:





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