



Life Science in Iceland

Introduction



PROMOTE ICELAND



Promote Iceland initiated the first mapping of the life science sector in Iceland, focusing on health technology, medical device, pharmaceutical science companies, and biotechnology.

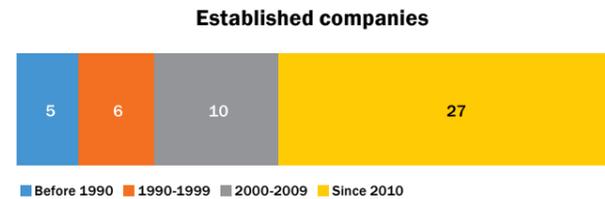
The purpose of this mapping is to understand objectives, technologies, and needs of Icelandic companies in this growing sector. The results of this mapping indicate a lively and innovative space, characterized by slow, yet steady, growth. Additional findings illuminate on advantages for life science companies established in Iceland, as well as areas of improvement in the sense of disadvantages.

THE ICELANDIC LIFE SCIENCE SECTOR ENCAPSULATES THE FOLLOWING SUBSECTORS:

- Medical Device
- Health Technology & Software
- Biotechnology
- Pharmaceutical Science
- Generics & Biosimilars
- Health Supplement Production and Sourcing

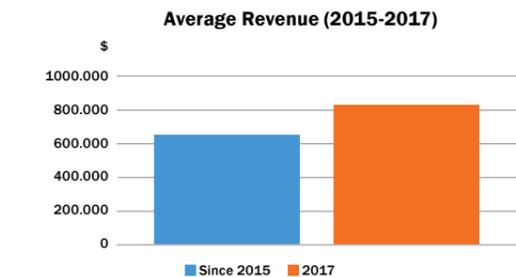
Background of Companies

The mapping initiative focused on those companies in the life sciences sector. A total of 48 companies were included, with seven seeking anonymity. All of the companies were headquartered in Iceland, and primarily Reykjavik. Moreover, a majority of the companies (56%) were founded post-2000. Companies remain relatively small in employee headcount; an average of 14.4 of global employees, with 12.3 of those employees being within Iceland.



Sales and Export Strategies

Life science companies experienced slow, yet steady, growth from 2015 to 2017. With the average annual revenue growing from \$650,000 in 2015 to \$825,000 in 2017, the average growth equates to about 27% during this period. In 2015, approximately 54% of companies were pre-revenue, declining to 54% by 2017.



Overall, approximately 70.3% of income was associated with exports in 2017. Main countries/regions of export are the U.S., Scandinavia, Germany, and Asia (centrally China). All companies are focusing on increasing their exports and view the U.S., China, and central Europe as key targets.



Countries where Icelandic life science Companies are Currently operating.

Marketing and Sales Tactics

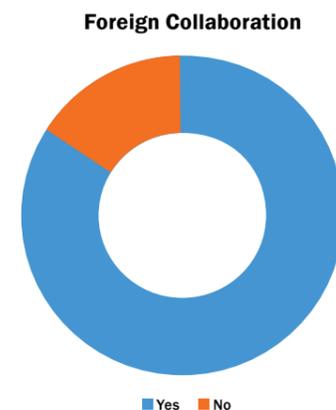
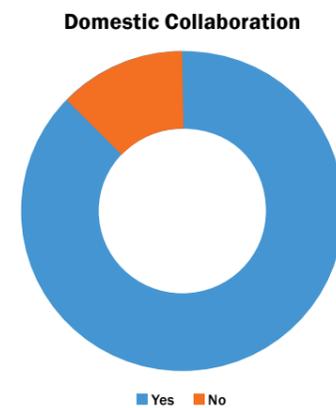
Life science companies vary in their approach to commercialization, which is primarily the result of the structure of their end clients. With many marketing direct to consumers (e.g., patients) and others producing material or supplies for distribution partners, the following focuses on the structure of their approaches.

Of the surveyed companies, approximately 84% indicated direct sales activities as their primary commercial tactic and only 3% utilize a branched location for sales, indication that most are conducting sales from within Iceland.

A variety of tactics are shared by the vast majority of life science companies. For instance, a majority of companies (77%) are focusing on leveraging partners and resellers, particularly abroad, 74% have distribution and retail partners abroad, and 97% of companies are attending international conferences, trade shows and exhibitions.

Collaborative Efforts

As a means of knowledge-sharing, peer support, marketing/sales, increasing economies of scale, etc., most companies are expanding their collaborative efforts domestically (87%) and abroad (84%) with other companies in the same sector. Deeming it important, with varying reasons, the vast majority (94%) would like to see an increase in possible collaboration within the domestic sector.



Views of the Life Science Sector

A majority of companies interviewed view it as a uniqueness and advantage being a life science company in Iceland, which include:

1. Access to rich, complete health data
2. Significant knowledge in generics and biosimilar pharmaceuticals
3. Positive, strong start-up environment
4. Innovation & talent pool in IT
5. Location between U.S. and European markets
6. Multiple energy streams for low cost production
7. Sophisticated research & development
8. New Research & Development Financial Incentives
9. Access to unique raw materials, biodiversity

Disadvantages

Counter to the advantages, all companies indicated disadvantages to being from Iceland, which revolved primarily around:

1. Proximity to target markets and experts
2. Difficulties scaling: no domestic market within healthcare delivery
3. Talent pool scarcities in areas of expert knowledge
4. Investor market is very weak; inaccessible venture capital
5. Fluctuating currency

Participating Companies

3Z Pharmaceuticals

3Z is a preclinical drug company focusing on the discovery of Central Nervous System (CNS) drugs. It provides pharmaceutical companies with expert services in high throughput screening of small molecule libraries for CNS effects. We offer screening assays for sleep indications, epilepsy (seizures), and ALS.

Akthelia

Akthelia is an emerging pharmaceutical founded by four eminent professors, two from the Karolinska Institute in Sweden and two from the University of Iceland. The company is focused on the discovery and development of therapeutics which enhance and deploy the body's own innate microbial defence mechanisms to combat debilitating infectious diseases. This novel mechanism of action elucidated by Akthelia, underpins the development of the Company's pharmaceutical actives.

Algaenovation

Algaenovation offers consistent year round supply of ULTRA High Omega-3 algae, improving the survival and growth rate of fish larvae, crustaceans and mollusks, resulting in overall improvement of their nutritional composition.

Alvican

Alvican was established after a successful participation in the NORDIC INDEPENDENT LIVING CHALLENGE held by the Nordic capital cities and Nordic Innovation. The company is dedicated to develop solutions for E-health with focus on elderly and disabled. Solutions for the rapidly increasing number of elders in the Nordics is our main tasks.

Alvogen

Alvogen is a global, privately owned pharmaceutical company focused on developing, manufacturing and selling generic, brand, OTC and biosimilar products around the world.

BioPol

BioPol is a marine biotechnology company located in Skagaströnd in Northwest Iceland. The goal of the company is to examine the biota of Húnaflói-bay, undertake research in the field of biotechnology and support innovation in the field of marine biotechnology. Moreover, the company intends to undertake the marketing and sale of products and services based on marine resources. Research on the biology of Húnaflói-bay and the neighboring continental shelf with the goal of increasing knowledge of its ecology and possibilities for better and innovative utilization of marine resources.

Codland

Codland's goal is to promote progress in the fishing industry through innovation and collaboration. The company was founded in 2012 when the Iceland Ocean Cluster brought together seven fishing and ocean-related companies and set the course to create maximum value from every part of the fish. Our goal is to maximize the value from each part of the fish. New valuable products are created from underutilized raw materials using innovative biotechnical solutions.

EpiEndo Pharmaceuticals

EpiEndo Pharmaceuticals is a privately held Icelandic pharmaceutical company developing a proprietary portfolio of compounds with epithelial barrier enhancing properties. EpiEndo is seed-funded, privately held and in preclinical development. EpiEndo is focusing on chronic respiratory diseases. First clinical trials are planned for the year 2019.

Expeda

Expeda produces quality medical bioinformatics diagnostic tools that allow the best practices to be captured, distributed and automated. Expeda's goal is to help our clients become leaders in providing quality healthcare at minimal cost using our highly efficient expert solutions. Delivering quality medical products for the treatment and prevention of Osteoporosis and Rheumatic diseases, the company builds its professional health care service on trust and integrity.

Feel Iceland

Feel Iceland was founded in 2013 around the idea of a truly different approach to premium skincare. Located in Reykjavík Iceland, Feel Iceland utilizes pure ingredients originated from the pure ocean surrounding Iceland, not only for outer use but also for intake, for better results.

Florealis

Florealis is a pharmaceutical company providing solutions for people that want to use high quality herbal medicinal products to stay healthy. Our medicines are natural products based on long experience as well as scientific evidence and are approved by European health authorities.

Geosilica

geoSilica is the leading Icelandic company in the research and development of extracting minerals from geothermal water. The company has successfully extracted silica mineral for the production of health care products. geoSilica Iceland offers consultancy in analysing geothermal water.

Hyndla

Hyndla ehf seeks to develop and produce valuable Icelandic seaweeds.

Kerecis

Kerecis develops the Kerecis™ Omega3 acellular dermal matrix technology for use in products to treat chronic wounds, for dura mater repair, breast reconstruction and abdominal wall reconstruction. Our patent pending acellular fish skin derived material improves upon current human and porcine technologies through improved economics and clinical performance, reduced disease transfer risk and absence of cultural constraints on usage. Kerecis develops the mOmega3™ fatty acid technology for use in several dermatological indications, including; psoriasis, eczema, dermatitis, keratosis pilaris and pseudofolliculitis.

Key Natura

KeyNatura is a dynamic biotech business, located in one of the most pristine environments on earth – Iceland. Our focus is a pure, natural form of the powerful antioxidant Astaxanthin, produced from microalgae using exciting new technology and sustainable resources. We offer high-quality consumer products that are safe and vegan friendly, as well as active compounds, technical tools and expertise for other companies.

Kvikna

Kvikna is an international software development firm providing technical solutions for the medical, financial, educational, environmental and scientific industries. We excel in implementing complex algorithms, designing and storing

information in an optimal and accessible way, and presenting the resulting software package in an elegant, user-centered interface – all to meet your specifications. We specialize in medical and technical software solutions, and have the technical expertise and regulatory processes in place to deliver.

Lifeind/Biocule

BioCule provides one and two dimensional nucleic acid microelectrophoresis systems. It offers its systems for the size distribution and relative amount detection of double-stranded DNA, single-stranded DNA, RNA DNA hybrids, crosslinked DNA, and damaged DNA and DNA repair.

BioCule's systems also offers information on nucleic acid samples through complex PCR, cDNA synthesis, CHIP-sequencing DNA, NGS sample preparation, and detection of DNA damage either in vivo or in biobank samples. Jon Jonsson founded it in 2000, with its headquarters in Reykjavik in Iceland.

Lysi

LYSI as a leading producer of fully refined fish oils for human consumption is at the forefront of research and product development in its field, and emphasises strict quality control when it comes to developing, manufacturing, and selling its products.

Since its foundation in 1938 the company has built up extensive knowledge and become a global leader in the production of fish oils in bulk as well as products intended for sale to consumers.

Marinox

Marinox is an innovation company specializing in the extraction of bioactives from marine algae. Only algae of the highest standard, harvested from the cleanest waters of the world, are used in our products. Marinox marine algae extracts therefore have a unique, pure quality. Marinox extracts are available for use in health, nutrition and personal care markets.

The company was founded in 2011 and is based in Reykjavik, the capital city of Iceland. At Marinox we build on several years of extensive research on bioactives in marine algae.

Medilync

Medilync was founded with the goal of revolutionizing the way diabetes is managed and treated in a value-based care landscape. Medilync designs and develops with three key concepts in mind: (1) alleviating the burden of diabetes with simplicity, (2) activating and engaging patients, as well as their families, friends and providers, and (3) answering the simple question of “would we want our friends and family using it?” Medilync links healthcare data from all sources in our predictive analytics, Big Data platform – Cloudlync.

Mentis Cura Diagnostics

MentisCura, based in Reykjavik, Iceland, is a privately held diagnostic company serving clinicians and pharmaceutical clients with state-of-the-art services and technology to improve and accelerate the differential diagnosis of CNS disorders. The



company currently operates the world's first fully automated EEG-based biomarker service for clinicians through its own clinic and remotely via electronically transmitted EEG recordings.

Mint Solutions

Mint Solutions builds tools to help nurses and doctors provide exceptional care for patients. Our first product is MedEye which ensures patients get the right medication at the right time, improving safety, saving lives, and reducing the costs of medication errors world-wide. Backed by long term investors and an outstanding development team, Mint is expanding across Europe.

NeckCare

NeckCare provides a diagnostic and treatment technology platform for objective, clinical grade neck assessments and rehabilitation and outside the clinic therapy to optimize patient outcomes. Leveraging its patented diagnosis and treatment methodology, the Butterfly Method, and a secure, HIPAA-compliant web-based, NeckCare assesses neck mobility, provides recommended therapy exercises, and tracks the progress of patients with recurrent and chronic neck pain.

Nox Medical

Nox Medical was founded in 2006 by engineers, investors and medical professionals with extensive experience in providing industry standard solutions for sleep monitoring and diagnostics. It's our main goal to bring to the market a new generation of products to support the growth of sleep medicine with easy to use solutions, embraced by established practitioners

Oculus

Oculus is a clinical stage biotechnology company focused on the development of novel and transformative topical treatments (eye drops) for ophthalmic diseases for both back and front of the eye. Oculus' novel eye-drop treatments provide an unprecedented technical advance in ocular drug delivery, particularly for the back-of-the-eye diseases that are currently managed by invasive methods only such as intraocular injections or implants. Oculus' novel eye-drop treatments are based on its proprietary solubilizing nanoparticle technology that improves both the ability to formulate drugs as eye drops and their bio availability in the eye tissues including both the front and the back of the eye.

ORF Genetics

ORF is committed to economically viable and enabling solutions for the production of recombinant proteins, such as human growth factors and cytokines, using its Orfeus™ expression system. ORF has developed the unique expression system Orfeus™, which uses barley grain as a vehicle for high-volume, high-yield production of recombinant proteins. The barley seed is for many reason an ideal production host for recombinant proteins, such as providing inert and endotoxin-free environment, and long-term protein storage before processing of the proteins. This has been basis for ORF's two successful product lines on the market and numerous high-potential pipeline projects: BIOEFFECT and ISOKINE

Oxymap

Oxymap is an Icelandic company whose flagship product is the Oxymap T1 – a solution for non-invasive ocular measurements. The company produces novel imaging products and services targeted towards eye-care professionals and clinical researchers to further the understanding of common eye diseases. A team of researchers established Oxymap in Reykjavik in 2002. Their efforts lead to the creation of the Oxymap T1 add-on for a fundus camera, which allows for non-invasive retinal oxygen saturation and vessel-width measurements. The device and accompanying software provide user-friendly access to metabolic and structural information with a single image. Customers at many international institutions are currently relying on the Oxymap T1 for their investigations.

Platome

Platome Biotechnology was selected as the Startup of the Year 2017 by the Icelandic Business Magazine, won the Rising Star Competition held by Deloitte in 2017, has been featured in Wired Magazine, in Startup Guide Reykjavik by Startup Guided World and been named as one of Iceland's hottest startups to watch. At Platome Biotechnology we are reinventing how stem cells and other human cells are grown in laboratories. We use human blood platelets to create a range of products and biochemical solutions that are used as feedstock for the cells. The aim is to make the development of cellular therapies both easier and safer. Our products eliminate the current need for animal blood to support growing cells. By eliminating animal blood from the process, development of cellular therapies becomes much safer, faster and more reliable.

Primex

Primex ehf is an Icelandic marine biotech company who is a global leader in the manufacture and supply of pure chitin and chitosan derivatives. Primex is born global and dedicated to innovate and market scientifically sound and novel natural ingredients for use in numerous markets like, nutritional, cosmetic, food and biomedical.

Protis

PROTIS was founded in 2015 and is owned by FISK Seafood Ltd. The company's focus is on the commercialization of Icelandic cod proteins, IceProtein® with proven health benefits for use in dietary supplements, AMÍNÓ®. The company's mission is to leverage the accumulated knowledge that Iceprotein and FISK Seafood have gained through decades of research and practices within the seafood sector to provide unique fish proteins for the benefits on individual health.

Raförninn

The company, Rafoinn, was founded in 1984. The mission is to provide consultation and modern technological service to the medical imaging community. Including f. ex. site planning, software design, acceptance and status testing, PACS services and implementation of QA programs.



Risk Medical Solutions

Risk Medical Solutions (RMS) uses individualized risk analysis to control the use of health-care resources in chronic diseases such as diabetes and hypertension. Our software functions as a restructuring device that aligns current available health care resources with current needs of patients. Our company uses information technology and epidemiological data to create solutions that give a precise risk and severity profile of individuals and improve quality of care and reduce cost.

Saga Medica

We have strong ties to Icelandic history. The medicinal herbs in our supplements have been used as herbal remedies by our ancestors for more than a millennium. The herbs in our products are collected in the pristine environment of Iceland. We feel a strong connection to Icelandic nature and our harvesting process is very eco-friendly. SagaMedica has an academic background and the company is founded as a result of extensive research on which we base our products.

SidekickHealth

SidekickHealth is a gamified health behavior change service that predicts, manages and prevents chronic and lifestyle-related conditions. SidekickHealth improves health the fun way with solutions for employee wellness and diabetes prevention programs. SidekickHealth solutions are proven and evidence-based, improving health & well-being of populations by targeting the emotional systems in the brain where most lifestyle decisions are made.

Star-Oddi

Founded in Iceland in 1985, Star-Oddi has become recognized as one of the world's leading manufacturer of small, reliable data loggers for life and environmental science.

We have over 30 years of experience in making small, high performing loggers for four main markets:

- *Underwater environments and subsea gear*

- *Aquatic animals*

- *Wildlife and laboratory animals*

- *Production quality control*

Star-Oddi offers a wide range of products including temperature, depth, salinity and tilt loggers for environmental research, and leadless, implantable heart rate, temperature and activity loggers for laboratory and wildlife research.

Taramar

Since 2005, Dr. Gudrun Marteinsdottir, Professor at the University of Iceland, has been on a mission to develop skin care that is totally safe both for the skin and the inner body. Through her work on the biology of marine organisms she became increasingly inspired by the hidden healing potential of seaweed

and other marine sources. The TARAMAR products embody an accumulation of discoveries based on long term research performed by her and other university professors. Our research has shown that several types of Icelandic seaweed contain bioactive compounds that stimulate beneficial responses in the skin and protect live cells from oxidation and aging. Observing the potency of seaweed and medicinal herbs, Prof. Marteinsdottir was inspired to create a skin care product that causes clearly visible beneficial results and is also exceptionally pure and safe for the skin and body. The idea grew into a holistic concept where quality, safety and honesty take first place.

Thorverk

Thorverk offers highest quality of dried Ascophyllum and Laminaria from the scarcely populated Breiðafjörður, W. Iceland. The products are certified as being pure organic and sustainably harvested. Founded in 1986 Thorverk hf. uses geothermally heated pure ground water at Reykhólar and the abundant seaweed grounds of the fjord. Our motto is to provide excellent quality based on safety and environmental caution.

Thula

At Thula, our vision is to build innovative solutions that help our customers cut costs while also provide outstanding healthcare. Our mission is providing first class software solutions to the healthcare sector, based on our extensive experience and proven track record in delivering successful projects. We are software company with domain expertise and broad experience in the field of healthcare related software solutions. Mission critical solutions for medication management, drug logistics and electronic exchange of healthcare information are our primary focus areas. Our product concepts originated with the users. For almost 20 years, Thula's specialists have collaborated with relevant professionals in several European countries to design our systems and based the technology on their needs.

Zeto

Icelandic biotech/skin care startup company that has developed a sustainable new method to produce cosmetic grade seaweed extract, without the use of chemicals. Based on this extract, Zeto has created a line of seaweed based skin care products.

Zymetech

We are the global leader in the therapeutic application of marine-derived enzymes. Our technology of developing and manufacturing formulations containing marine-derived enzymes is called the Penzyme® technology and is at the core of our intellectual property. Our use of cod enzymes (that we call Penzyme®) for therapeutic application is protected by a global patent. Our core and clinical research have demonstrated effectiveness of Penzyme® against a variety of skin conditions, wound healing and viral and bacterial infections.



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