



Agribusiness | Animal Pharm

Disruptors & Innovators 2020

Company Profiles; Trends and Insights; Investments;
Conferences; Landscape Mapping

Please find the contents and sample pages below. If you have any questions, or would like to speak to a member of our team about this report please use our [contact us](#) page.

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Executive Summary: Mapping the Landscape of Animal Health Start-Ups

Trends and Insights into the Animal Health Industry 2020

This is the second Disruptors and Innovators report to be published by Animal Pharm, which takes account of the start-ups that are making impactful advances in the animal health industry in 2020.

In the last report, over 115 start-ups were examined with companies working on technologies ranging from vaccines, animal nutrition, microbiome health, diagnostics and digital technologies. In this year's report, we take a look at the top 20 most innovative start-ups from the 2018 report, and update readers on the progress they have made in just two short years. Besides, this report covers over 100 young companies who are trail blazing through the animal health industry, with many newly emerging on the start-up scene.

A quick recap of the top 20 start-ups from the 2018 report shows over 80% of the companies we selected have gone on to make significant advances within the industry. In this report, we cover whether the previous top 20 secured funding, gained partnerships, added management, progressed R&D, launched products or achieved regulatory milestones. Partnerships established within the past two years helped our selected start-ups set up relationships with companies ranging from Boehringer Ingelheim Animal Health, Virbac, Elanco, Bayer Animal Health and Dechra Pharmaceuticals, to name a few.

Overall, 20% of the start-ups were able to secure multi-million-dollar funding and over 40% of the top 20 significantly advanced their R&D pipeline. These are impressive feats to accomplish within 24 months and speaks to the determination and resiliency of young companies in the animal health industry.

This year's crop of start-ups is no less impressive, with technologies ranging from more traditional animal health products such as vaccines and diagnostics, to more progressive offerings like insects for feed and cannabis products for pets.

An interesting trend in this year's top 20 line up was the capturing of data to quantify the quality of life of companion and production animals. Over 30% of the start-ups that made our top 20 list had some type of questionnaire, sensor or wearable technology – all measuring an animal's perceived welfare. Sustainability and nutrition were also captured in this year's list as several start-ups were working on methane reduction in production animals and modulating either the microbiome or alternative feed stuffs to nurture animals better.

Not as surprising, is the inclusion of aquaculture technologies, which have recently surged in the past years with an industry-wide emphasis on meeting the global demand for protein. Both aqua-tech start-ups listed in our top 20 are harnessing the power of data collection to count sea lice and risk forecasting. The remaining start-ups were more along the line of conventional animal health products like pet monoclonal antibodies or point-of-care diagnostics.

The overall analysis of start-ups in this report, highlights over 100 of the most progressive companies in the industry. Much aligned with the 2018 report, this year saw many non-traditional animal health companies making strides and breaking ceilings. Companies like Ÿnsect, which shortlisted in our 2018 report, successfully raised \$139.9 million as part of its series C financing in February of 2019. The largest agtech investment outside of the US, which helped them increase production by building the “world’s largest insect farm” specific for mealworms. A similar company showcased in this report, Entocycle, is forging down the same path as Ÿnsect. However, it is using black soldier fly larva as a protein alternative.

A new company debuting in this report is Biotangents, which is a UK-based company following the conventional route of animal health products by developing a simple and adaptable diagnostic technology for detecting genetic markers of infectious diseases. This takes the focus from large centralized laboratories and puts the test in the hands of veterinarians on site. Its first test detects bovine viral diarrhea, which is responsible for £61 million in economic damage in the UK alone. This company is comparable to AgPlus Diagnostics, highlighted in our 2018 report, with the main difference being a test distributed in an immunoassay form.

Another comparable couple is Fitbark and Felcana. While Fitbark is our latest report, Felcana featured in the 2018 report. Both are wearable technology companies.

US-based Fitbark builds collar sensors and software that collects data about a pet’s location, activity, quality of sleep, overall behavior, and other welfare metrics. To date, it has received \$3.2 million in seed capital and are working with partners like Fitbit and Elanco. This compares to UK-based Felcana, which has a kit that uses scientific algorithms to interpret pet behavior patterns such as drinking, eating and sleeping.

These are just three examples of recently emerged start-up companies that have exploded onto the scene within two short years. Such quick improvements on technology and differentiation on market needs speaks volumes to the fast-paced and changing landscape of the animal health industry. Companies must be agile and fluid, adapting to customer needs and meeting industry demands. This type of movement is hard for the large multinational corporations to keep up with, giving start-ups a unique niche to thrive in. Those companies which can develop and execute product plans and growth strategies, have the highest likelihood for acquisition or licensure.

As one will see in this year’s report, technology is ever-changing, and your friend today may become your competitor tomorrow. Thus, forging forward with a robust competitive advantage is the only way to maintain success in this dog-eat-dog time.

however, this is a burgeoning space within the sustainable food category and prime for innovations as well as investments.

1.1 The Influence of Conferences

These same insights are also reflected in the yearly investment forums which happen in the US, Europe, Asia and Latin America. These conferences are unique in the fact they bring together the key players in the industry: large animal health companies, complementary service providers, investment firms and start-ups.

When it comes to innovations in animal health, there are two well-respected forums in which animal health start-ups attend worldwide. The Animal Health Investment Forum Europe happens every February in London where in 2019 there was over 150 start-ups in attendance, with companies coming from near (the UK, France, Germany) and far (Australia and the US). The other well-known conference is the Kansas City Animal Health Corridor Investment Forum, which happens every August in Kansas City, Missouri. The Corridor's event also attracts worldwide ventures as this year's forum saw over 16 countries represented and over 35 states sending start-ups to compete for partnering opportunities and a shot to bag investment capital.

Following the acquisition appetite of the large animal health players, a recent surge of technologies and software are taking over the main stage at the investment conferences. For example, during the Animal Health Investment Forum Europe, cloud computing company Rex Animal Health took home the 2019 Innovation Showcase Award and winner of the Kansas City Animal Health Corridor Investment Forum's Innovation Award winner was SwineTech, which is an audio artificial intelligence technology designed to prevent piglet death.

Some of the attractiveness for animal health start-up technology companies echo that of traditional tech companies – they are easily scalable, have lax regulatory pathways, require fewer initial funds and have a shorter delivery timeline. It is clear to see that digitalization of animal health is a hotbed area where start-ups are innovating, and investors alongside of large animal health companies are perusing.

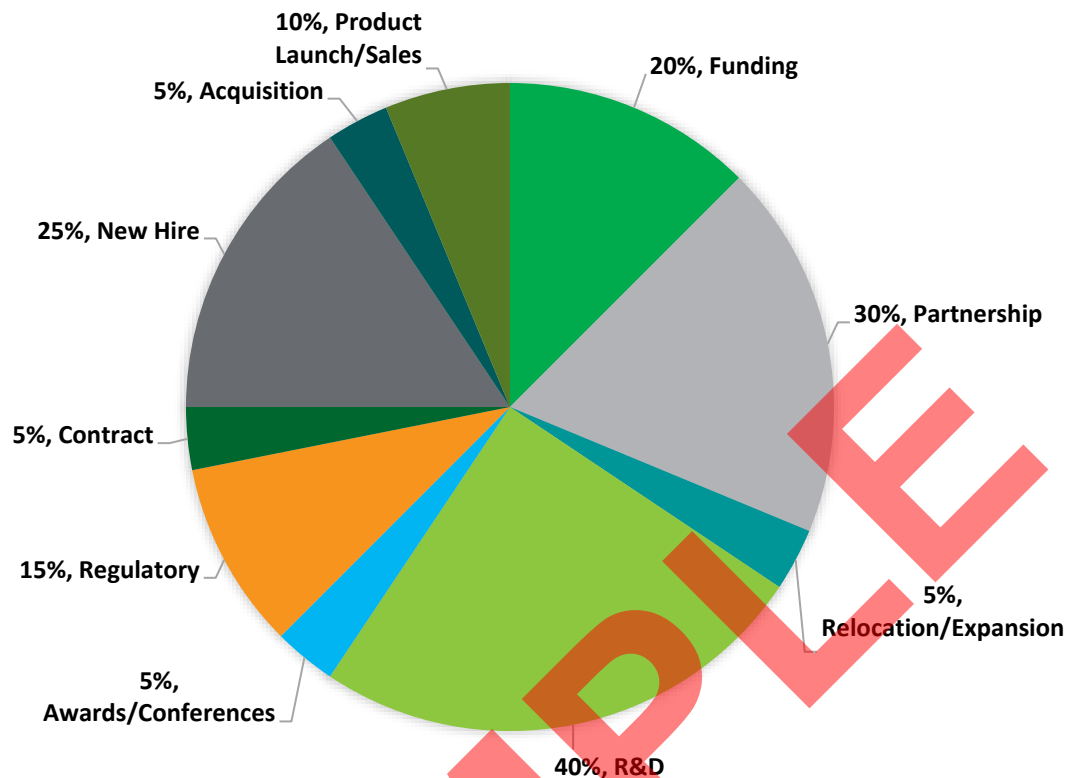
1.2 Investments in Animal Health

One of the critical factors for a thriving start-up ecosystem is access to capital. To ensure advancements innovation for the animal health industry continue, funding must be made available to small- and medium-sized companies.

Funding start-ups in the animal health world is a new and evolving space that has followed the traditional funding pathway of human health with the flair of less capital upfront and the potential indication in numerous species. Many of the same pitfalls that surround human health investments mirror themselves in animal health start-ups, with fewer options to secure capital.

Just over ten years ago, one would be hard pressed to find an investment firm that solely invested in animal health. Usually start-ups would have to go to a human health fund with no expertise in animal health and pitch a \$100 million opportunity next to five or six other human health companies bolstering a \$1 billion return. For obvious reasons, the animal health start-ups had a hard time raising capital.

Figure 1: Top 20 Start-ups in 2018 activity



PANION ANIMAL HEALTH

In November 2018, Panion Animal Health entered a pilot study for its canine epilepsy drug candidate in North America after a successful study at the University of Copenhagen. The Swedish company is developing a gene therapy and recently gained positive safety results following the clinical phase of its treatment study of drug refractory epilepsy in canines.

Anja Holm – chief executive of Panion – said: “The next step in the product development will be the pilot study in privately-owned dogs with drug refractory epilepsy, which we intend to conduct in a specialized clinic in North America. We have established good co-operation with a specialist veterinary clinic with full equipment and highly skilled staff, including veterinary neurosurgeons and neurologists.”

Targeting a debut commercial launch on the US market, Panion met with the US FDA Center for Veterinary Medicine (CVM) in Washington DC in November 2018. The pre-submission conference allowed the firm to explain the technology, its development status and future plans.

At this point in time, the company had reduced its loss during the third quarter of the year, as well as the first nine months of 2018. In Q3, net loss was SEK536,000 (\$59,000) – compared to SEK923,000 that time last year. At the nine-month stage, loss was SEK2.53 million versus SEK3.35 million during the same period of 2017. Dr Holm told Animal

at the veterinary clinic LIVS in New York – is on hold until the decisions of an extraordinary general assembly called by CombiGene have been finalized.

With Panion's board of directors deciding to terminate the firm's current study plan, the INAD application for the canine gene therapy was withdrawn to avoid any fees for the 2020 fiscal year. Panion stressed no negative events have occurred in the planning of the study or with the product and a new INAD application can be opened at a later stage.

GLOBAL STEM CELL TECHNOLOGIES

In December 2018, after signing an exclusive European distribution deal with Belgium-based Global Stem Cell Technology (GST) for Arti-Cell Forte, Boehringer Ingelheim Animal Health brought the first veterinary stem cell medicine recommended for EU marketing authorization into its portfolio. Arti-Cell Forte received a landmark positive opinion in June and is expecting to receive full approval for the European Commission in the fourth quarter of 2019.

Arti-Cell Forte is indicated for the reduction of mild to moderate recurrent lameness associated with non-septic joint inflammation in horses.

In March 2019, GST claimed it was close to completing a field study of stem cell technology in treating tendonitis in horses. GST has already finalized target animal safety studies and proof-of-concept trials for this indication.

In April 2019, Boehringer Ingelheim Animal Health launched Arti-Cell Forte in Europe for the reduction of mild to moderate recurrent lameness associated with non-septic joint inflammation in horses after getting approval for marketing.

Currently, GST is in discussion for the commercial rights of Arti-Cell Forte across the rest of the world. The firm claims its other products, such as GST002 for tendonitis, are receiving significant interest.

The company is also developing its stem cell technology to treat different orthopedic and metabolic diseases in horses and dogs. These product candidates are currently all in the pre-clinical or proof-of-concept stage.

GST is intensively working on a next-generation canine osteoarthritis product, which could prove to be paradigm shift versus the current standard of care with its potential superior safety profile and dosing regimen.

Since inception, the company has published 25 peer-reviewed scientific publications in the area of veterinary stem cells and patented its core technology. In the first quarter of 2019, GST has already published three original scientific research manuscripts in leading journals.

PETMEDIX

In February 2019, UK-based PetMedix secured \$10.4 million in a series A raise that will be used to begin drug discovery. PetMedix is a development stage veterinary biopharmaceutical company that builds platforms to generate fully species-specific, therapeutic antibodies for a plethora of indications. The investment round was led by New York-



ALGENEX SL

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Business description

- Algenex is a private biotech company with proprietary and patent protected technologies that seek to overcome some of the challenges faced in the manufacturing of protein-based pharmaceutical products.
- Its first technology, TopBac, is an expression cassette that boosts the production of recombinant proteins using Baculovirus vector expression systems (BVES) in insect cells.
- Its second and most disruptive technology, CrisBio, takes this approach one step further by using the chrysalises of the *Trichoplusia ni* Hübner (commonly known as the cabbage looper) as natural, single-use bio-capsules. CrisBio is an automated process that enables productivity of gram/litre levels, avoiding the setup of costly infrastructure and offering almost unlimited and immediate scalability, production flexibility, simplicity and versatility.
- By harnessing nature for simple, scalable and cost-efficient manufacturing tools, Algenex aims to transform protein production to enable universal access to biotechnology-based products, providing:
 - a solution to the capacity constraints faced in the first world to produce protein-based therapies
 - a possibility to manufacture cost effective therapies that can be made available in developing countries
 - a system with linear scalability that allows the production of small batches to meet the needs of niche indications
 - a production system that allows a rapid response to pandemics and disease outbreaks
- Algenex's initial focus is on animal health. The current portfolio comprises several vaccines across livestock species, with proof of concepts already generated in >20 additional vaccine antigens. The company has entered into partnerships with animal health companies to develop other protein-based products. Further applications of CrisBio are in the diagnostics sector, where the technology is being used to manufacture reagents for *in vitro* diagnostic tests for both animal and human health.

Management Team

Claudia Jiménez
General Manager
 Jose M. Escribano
Chief Scientific Officer
 Virginia Gonzalez
Chief Financial Officer
 Romy M. Dalton
Chief Operating Officer

Year Founded

2005

Biotangents

BIOTANGENTS

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Business description

- Biotangents have developed a simple and highly adaptable diagnostic technology for detecting genetic markers of infectious diseases. They are building this into innovative and portable same-day diagnostic solutions for veterinary infectious diseases.
- Currently, diagnosis of many infectious animal diseases is centralised in large laboratories. For farmers, vets and animals this means long wait times of days or even weeks for infectious disease diagnostic results. Each day's delay is a day of uncertainty for veterinarians, sickness for animals and lost profit for farmers. This incurs huge costs in lost effort, spread of infection to other animals and ineffective use of antibiotics until an accurate diagnosis is delivered. These effects are most acutely felt where farmers and veterinarians lack quick access to laboratory testing, as is the case in many agricultural areas globally.
- In response to this, Biotangents are developing an innovative portable diagnostic device for fully automated infectious disease testing. This allows veterinarians to test animals for disease on site, with minimal equipment and without delays. Biotangents' first product is being developed for bovine viral diarrhoea (BVD). BVD is responsible for an estimated £61 million in economic damage in the UK alone by promoting bovine abortions, pneumonia, and other secondary infections that often require antibiotic treatment.
- With Biotangents' technology, animal blood is added to a cartridge and then inserted in the incubation hub. From there nucleic acid extraction and molecular diagnosis is performed automatically in the cartridge. The diagnostic result can then be automatically sent digitally to veterinarians, farmers, and uploaded into disease surveillance databases. By receiving a same-day diagnosis, farmers can quickly remove infected animals from their farms to prevent disease spread, as well as save time and money in quarantining and veterinary work.
- The control of veterinary diseases is a global health issue of enormous importance. The World Organisation for Animal Health estimates that 20% of animal productivity is lost due to disease and that 60% of human pathogens originate from animals. Every year five new animal diseases emerge, of which the majority will be transmissible to humans. This issue is exemplified by the on-going novel coronavirus outbreak, which originated from a live animal market and threatens to become a global pandemic. These incidents are increasingly likely as the world population increases to 10 billion by 2050, coinciding with a 60% increase in meat and milk demand.

Management Team

Alan Hale

CEO

Lina Gasiūnaitė

Founder and Director of Science

Dr Any Hall-Ponsele

Founder and Director of Operations

Year Founded

2015



CANNPAL ANIMAL THERAPEUTICS

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Business description

- CannPal Animal Therapeutics is a publicly listed animal health company with a mission to provide pet owners and veterinarians with access to high quality, evidence based, plant-derived therapeutic products to promote better health and well-being for animals.
- As a result of the changing dynamics in pet ownership and the growing use of alternative therapies, the company has placed its present focus on the development of nutraceutical and pharmaceutical products using cannabinoids, the most commonly recognized active compounds found in the cannabis plant.
- More specifically, the company is researching CBD (cannabidiol) and THC (tetrahydrocannabinol) for the development of OTC and veterinary prescription medicines for the control of symptoms associated with skin and joint disease in dogs.
- CannPal said: *"Millennials aged 23 to 38 are now the biggest pet-owning generation, and their purchasing behaviours are evolving. Preventative care and animal nutrition are playing an increasingly important role in the management of animal health, and millennial pet owners are seeking new and innovative products that are more aligned with their own healthy lifestyles."*
- *"We believe that plant-based therapies like cannabinoids can play an important role alongside traditional medications as part of a more holistic approach to the health of animals"*

Management Team

Layton Mills
Chief Executive and Founder

Dr Margaret Curtis
Head of Research and Development

Geoff Starr
Company's Chairman

Year Founded
 2016

Core technology and intellectual property

- CannPal has two lead products in development which remain the Company's priority.
- CPAT-01 is the company's lead pharmaceutical drug candidate in development for FDA and/or EMA regulatory approval for the control of symptoms associated with osteoarthritis in dogs, with a focus on pain and inflammation.
- The drug is a standardized pharmaceutical product in a liquid oral solution, derived from natural THC (tetrahydrocannabinol) and CBD (cannabidiol) extracts, in a patent pending ratio designed to reduce the psychotropic effects of THC, while enhancing the pharmacokinetic and pharmacodynamic properties of both compounds.



MOOTRAL

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Business Description

- Mootral is developing natural feed supplements that reduce methane emissions from ruminants by up to 38%. Ruminants produce a large amount of methane, with estimates of greenhouse gas emission from livestock representing an estimated 14.5% of the entire world's greenhouse gas emissions. Cows are the highest methane producers among ruminants; however, they are a crucial part of demand for high quality meat raising amongst a growing population. It is estimated that the average cow produces more CO₂ per year than 5 average cars, creating a big problem in eco-friendly agriculture¹⁷.
- This is a natural part of the cow's digestion system that allows for enteric fermentation, enabling cows to transform biomass such as grass, into high quality protein. A by-product of this digest, is methane produced from the bacteria inside of the largest chamber of the cow's stomach, called the rumen.
- Natural plant extracts are an attractive alternative to synthetic products in animal health to modulate rumen fermentation. Garlic has been shown to reduce methane production *in-vitro*, *in-vivo*, and *ex-vivo*. In addition, plant flavonoids, such as citrus has anti-inflammatory properties and have been shown to improve rumen fermentation¹⁸. The two products together, work synergistically to decrease methane production, and in some situations, improve yield.
- Mootral claims that they have developed the world's first methodology under the verified carbon standard (VCS) methodology approved by Verra, an environmental monitoring body, for quantifying and monitoring methane emission by ruminants.

Management Team

Thomas Hafner

Founder & CEO

Isabelle Botticelli

Chief Operating Officer

Bora Karamustafa

Chief Commercialization Officer

Year Founded

2010

Core technology and intellectual property

- Mootral Ruminant is made up of two natural ingredients – garlic powder and citrus extracts. Natural plant flavonoids, such as citrus extracts, have anti-inflammatory, antioxidant and antimicrobial properties and are able to improve rumen fermentation. Mootral, a patented natural feed supplement made from fruit and vegetables. These ingredients can be easily integrated into the feed chain; thus, the farmer incurs no extra expense for its usage.

¹⁷ <https://www.mootral.com/about/>

¹⁸ <https://www.mootral.com/about/#research-content>

ABCELEX TECHNOLOGIES

North America, USA, Series A, \$2 million, Cultivian Sandbox Ventures, Pharma, farm, Biologicals, single-domain antibodies.

AbCelex Technologies is a biotechnology company based in Toronto, Canada. AbCelex has built a unique, fully integrated single domain (sdAb) or camelid antibody discovery and development platform that addresses the challenges of both drug discovery and drug development across a range of livestock and companion animal therapeutic indications.

AbCelex's core technology is a systematic and multidisciplinary platform for the development of efficacious and safe sdAb-based products.

The company's fully integrated antibody discovery platform develops therapeutic biologic-based solutions utilizing sdAbs (engineered into AbiBodies) from camelids (e.g. camels, llamas or alpacas) with highly predictable therapeutic outcomes. Camelid antibodies are naturally a fraction of the size of typical antibodies and have properties that lend themselves to bispecific and multi-specific applications, including several routes of administration allowing oral, topical, and infusion delivery.

The company's lead product candidate is being developed in food safety administered as feed additives and classified as veterinary biologics. AbCelex has demonstrated strong and reproducible efficacy and safety field trial data in livestock including broilers, layers and piglets within its *Salmonella* program.

www.abcelex.com

ACM BIOLABS

ACM Biolabs develops novel vaccines and antibodies using proprietary artificial cell membrane (ACM) technology. The company, headquartered in Singapore and operational since 2013, focuses on incorporating functional proteins into the ACM which allows them to be more stable and induces a strong immune reaction. The company has been able to show efficacy in both injected and oral dosages using different antigens and continues to grow their pipeline of vaccines.

The company has a subsidiary of AAVACC which is focused on veterinary vaccines, in which its vaccine has reached clinical phase I. The company also has two other human vaccine candidates that are in the lead discovery and preclinical stages for oncology and infectious disease, respectively.

At the end of 2018, the company announced that its subsidiary AAVACC's lead vaccines candidate, AVC-P118V, achieved a major milestone, as it offered protection to pregnant sows and their new-born piglets from the detrimental porcine epidemic diarrhoea virus (PED).

APIOTIX TECHNOLOGIES

ApiotiX Technologies is a Croatian based biotechnology company that was founded in 2018. The company has developed an alternative to antibiotics technology for treating subclinical mastitis that does not require milk withdrawal before or after administration.

The company is developing antibiotic alternatives using honeybee technology. All firm's technology uses pollen, propolis and royal jelly in the development of its products.

ApiotiX's lead product candidate is Apimast, is designed to treat and prevent subclinical and clinical mastitis in dairy cows. The company claims Apimast is the only product that can treat both clinical and subclinical mastitis without milk withdrawal period required.

ApiotiX is looking to raise \$2.2. million investment to advance the development of Apimast, however, the firm now is hoping to secure more funding for a new product which is a preventative intramammary product. This product could be put on the market sooner and for less funds.

To date, the firm has conducted a pilot *in vivo* on 86 cows which produced positive results. The start-up has been self-funded and received a European Regional development Fund grant for €400,000.

In June 2019, the company said they have found a partner in the area of dairy production and will be partnering with them on the development of products; however, they are open to other collaborations for its second mastitis prevention product.

<https://www.apiotix.io/>

APPLIED LIFESCIENCES & SYSTEMS

Applied LifeSciences & Systems (ALS-S) is a bio-systems company focused on improving the health and welfare of poultry, livestock and aquaculture industries. Established in 2015, ALS-S now calls Raleigh, North Carolina home with headquarters recently being moved from the Research Triangle. The company's lead product is an innovative, individualized vaccine delivery system for the poultry industry.

ALS-S's technology can detect, target, and deliver vaccines to each chick, ensuring vaccination. It can do this by integrating a conveyor belt system into high speed imaging, feature recognition, artificial intelligence, robotics and microfluidics in a system that is estimated to vaccinate up to 100,000 chicks per hour. The idea is vaccinating the chicks so effectively that they are kept healthier in during their life, reducing the need for antibiotics in the long run. Some of the top diseases that this vaccination system would be applicable for in the poultry would be coccidiosis, infectious bronchitis, and Newcastle.

PROTIX

Protix Biosystems – an insect farming company – produces food and feed products derived from black soldier fly (*Hermetia illucens*) larva. Based in Dongen, the Netherlands, Protix was founded in 2009 and is considered a leader in the global insect breeding industry.

To produce, harvest and process high-quality proteins, lipids and puree from black soldier fly larvae, Protix employs genetic improvement programs, high-tech factory systems, robotics and artificial intelligence. The company is using its technology platform to enter consumer markets with grasshoppers, crickets and mealworms. It trumpets insects as "the ingredient of the future".

In 2017, Protix raised \$50.5 million in equity and debt funding to expand its insect farming business. This is reportedly the largest investment in the emerging insect farming industry. Currently the company makes insect ingredients for feed products used in raising pigs, poultry and pets. Its lead products include Protix Protein X, Protix Lipid X, Protix Chitin X and a fertilizer, Protix Flytilizer X.

Protix is advancing the development of insect protein feed alternatives because it believes they are more resource-efficient than other protein sources such as soy, corn, forage, fish and meat.

In June of 2019, Protix opened 'the world's largest and most advanced insect farm in the world'. The facility is 15,000 square meters and is the company's second feed site in the Netherlands.

www.protix.eu

QBIOTICS

QBiotics is a clinical-stage pharmaceutical company focused in oncology and wound healing. The firm is based in Australia and develops drugs simultaneously for unmet medical needs in the human and the companion animal health markets globally. Its products are novel small molecules derived from the Australian tropical rainforest, identified using the company's proprietary EcoLogic search methodology.

QBiotics' lead drug is tigilanol tiglate, which is a diterpine ester that represents a new approach to the local treatment of solid tumour cancers. Tigilanol tiglate is safe, shows signs of efficacy against a range of tumour types, and can achieve complete response (tumour destruction and site healing) with side effects only those associated with the drugs' mode of action (namely, local temporary inflammation). It is fully protected globally by composition of matter and patents.

The firm's second drug is a wound management product known as EBC-1013. This compound is semi-synthetic and fully protected by composition of matter and use patents globally. It addresses chronic and acute wounds, as well as burns and blasts. The compound is in early-stage clinical development in animals and pre-clinical for humans, with first-in-human studies commencing in 2019. The compound is suspended in a topical gel. Two or three applications appear to reduce the microbial and bacterial load, accelerate wound closure, and minimize scarring in healing the site.

<https://qbiotics.com/>

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