

APPLIED VIRUSES INC.

"Software for Life"

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PRELIMINARY BUSINESS AND STRATEGIC PLAN

Applied Viruses is a biotechnology company aiming to lead synthetic virology, a new field founded on the computer-assisted design and manufacture of synthetic viruses. Synthetic viruses are the biological equivalent of computer software. Installed and booted in a permissive host cell, they can take control over virtually any cellular function, including the self-manufacture of more viruses. They make excellent drug delivery, antibiotic, and anti-cancer agents today and in future will become even more programmable and versatile, opening a wide range of product development possibilities.

Problem

Bioengineering, particularly new drug development, takes too long and costs too much.

Solution

Synthetic biology is the computer-assisted design and synthesis of biological systems. It makes biology much easier and cheaper to engineer. Viruses, with small genome sizes and broad versatility, are relatively simple and fast to design and manufacture. They are poised to become the "apps" of biology and be at forefront of the synbio revolution.

Mission

Make synthetic viruses. Specifically, develop, manufacture, market, and support synthetic lytic viruses that have immediate utility in the medical, veterinary, and environmental marketplace. Create a high-throughput virus assembly line (virus "biofab") with read-write (sequencing-synthesis) capability for in-house and external use. Attract and develop a technical viral design community. Maintain leadership in synthetic virology.

Objectives

Strategy: Build a general-purpose, flexible virus assembly line, demonstrate design-build-test capability, understand and optimize with synthetic phage, advance to eukaryotic viruses, build virus design expertise and cultivate crowdsourced virological talent, revolutionize biotechnology industry.

Product development: A three stage rocket. 1. Develop a phage product line suitable for household and industrial cleansers followed by phage for oral hygiene, and cosmetic acne markets, partner or sell at product development stage. 2. Make canine oncolytic therapies and, using this experience, 3. Make fully-personalized human therapies.

People: Assemble a team of people to lead the company through extremely rapid growth. Recruit high-level virological, web development, sales, and social networking experience.

Partnerships with phage portfolio: Partner with market leaders in household cleaners and oral hygiene such as Unilever for product development, regulatory approval, marketing, distribution and sales.

Contract manufacturing. Develop next generations of the phages for market leaders in phage products. Target all phage applications including phage therapy. Experience with phage will also permit contract nanoparticle (capsid) and plasmid development.

Canine oncolytic therapy development: Partner with Strömsholms Specialist Dog and Cat Hospital for R&D of oncolytic virus cancer therapy for dogs.

Planning: The following pages contain a preliminary business plan designed to present an overall picture. A full operating plan and budget will be developed by July 2012.

Financing: We anticipate Financing needs are outlined in Appendix A. Our objective is to raise seed money of \$500K by February 2012 and balance (\$1.5M) by September 2012.

Two Year Plan

1. Sales. \$200K of concentrated phage solutions for speciality cleanser and cosmetic formulations. Develop and sell 500 personalized canine oncolytic therapy subscription packages (cancer therapies for life) at average \$15,000. Total \$7,700,000 in products sales. We estimate about \$300K in contract and consulting service sales.
2. Operations. Set up an operating company in Sweden with 5-6 employees at the end of the first year and 15-20 employees by the end of year two.
3. Financing. We will manage company growth to achieve break-even cash flow by the end of second year.

Initial Product Class for Development (Year 1): Synthetic Phage

Phage are viruses that infect and lyse bacterial cells. They are highly specific to bacterial species and harmless to human cells. Hundreds of phage have been sequenced. Synthetic phage will be produced for specialized household and commercial applications and used to optimize viral assembly line.

Market: Kitchen and Bathroom Surfaces

Product: Synthetic viruses targeting *E. coli*, *Salmonella* sp. and *Listeria*

Summary of Marketing Approach:

- Focus on "natural" surface cleanser segment
- Evolve new formulations after newsworthy food-borne outbreaks

Market: Skin Care and Oral Hygiene

Product: Synthetic viruses targeting *Propionibacterium acnes* (Acne), *Solobacterium moorei*

(Halitosis), *Streptococcus mutans* and *Lactobacillus sp.* (cavities)

Summary of Marketing Approach:

- Focus on "natural" antimicrobial cleanser/oral rinse segment
- Emphasize safety, defined formulation, and quality control
- Offer personalized formulations for customers

Follow-on markets include specialty medical phage for antibiotic resistant bacteria, gastrointestinal illnesses, etc.

Second Product Development Class (Year 2): Synthetic Oncolytics

One in three humans will get cancer in their lifetime. It is also the leading cause of death in dogs over the age of 10. Oncolytic viruses (OVs) specifically target cancer cells and destroy them through lytic action and engineered secondary mechanisms (gene silencing, immune targeting, prodrug activation). Adenovirus is a popular OV and can work in both canine and human cancer treatment. Open source versions of adenoviruses are available. Many other viruses have oncolytic potential.

Market: Canine Cancers

Product: Adenovirus, Vaccinia virus

Summary of Marketing Approach:

- Partner with leading private pet hospitals with oncology division.
- Sell treatment subscriptions (viral-based therapies for life)
- Target high net worth pet owners seeking compassionate pet cancer care with human R&D dividend
- Work with local partner veterinarian to develop collection kit, diagnostic procedures, and effective treatment protocols
- Generate earned media in popular press and newspapers
- Advertise through heavily-trafficked pet websites

Follow-on markets include oncolytic viruses for cats.

Market: Human Cancers

Product: Adenovirus, JC Virus, others?

Summary of Marketing Approach:

- Focus on N-of-1 fully individualized treatment with Pink Army Cooperative and Sophiahemmet (private hospital) as partners.

Milestones:

1. Virus Assembly Line, synthetic phage library (electronic), 7 day production within 6 months.
2. Develop internal expertise and begin cultivation of an online viral design community by 12 months.
3. Eukaryotic virus library (electronic), 7 day production capability, 15 prototype personalized canine oncolytic packages sold by 12 months.
4. Canine Oncolytics collection Kit and R&D protocols developed by 18 months
5. 500 canine oncolytic packages sold by 24 months

Competitors

There are external competitors in the synthetic biology and virological fields.

Synthetic biology: Synthetic genomics, Intrexon, Ginkgo Bioworks, BIOFAB (also an ally)

Oncolytics: Amgen, Jennerex, Oncolytics Biotech, Oncos Therapeutics, Genelux

Phage Therapy: Phage Biotech Ltd., Pherecydes Pharma, Lisando, Microeos

Patents and Licenses

- We do not expect to file patents at this time but will review this position once virus assembly line is operational.
- The reference genomes for the viruses we will engineer are in the public domain and available online at the National Center for Biotechnology Information (NCBI).
- Our commercial success depend on in part on not infringing the patents and property rights of others. We will keep up to date on our freedom to operate and competing intellectual properties for technology, manufacturing and product portfolios.
- Open source viral engineering components available at MIT Registry of Standard Biological Parts and are suitable for proof-of-concept development.
- Derivative viral works will become trade secrets of Applied Viruses or released under creative commons license.
- We will create a formal licensing relationship with Genome Compiler Corporation, on whose platform we expect to develop our initial software tools. The Synbiota open source platform is an alternative.
- We have an exclusive relationship with Pink Army Cooperative.
- Potential for key partnerships with Karolinska Institute, SALSS, Singularity University, Autodesk, Inc., Halcyon Molecular (DNA sequencing), Cambrian genomics (Genome synthesis), Organovo (Tissue engineering), Aura Biosciences (Nanoparticle delivery systems), and more.

Risks

Synthetic biology represents a paradigm shift in genetic engineering and biotechnology. Legacy regulatory and intellectual property architectures are the largest barriers to our success.

Current Team

1. Alexandra Treschow, PhD. Responsibilities: CEO/CSO
2. Björn Hamberg, MBA, CEO, Alfa Rehab, Responsibilities: Finance and Operations
3. Gerard Ponce de Leon, MBA, Responsibilities, Sales, Business Development, Partnerships
4. Andrew Hessel, MSc, Co-chair Bioinformatics and Biotechnology at Singularity University. Responsibilities: Strategic planning

The team will be expanded over the next few months, adding deep expertise in virology and microbiology, DNA sequencing and bioinformatics, regulatory and legal affairs, web and database development, laboratory automation, social networking and marketing, and sales.

Appendix A -- 2 Year Preliminary Finance Estimates

Item	Cost	
	Year 1	Year 2
Lab Lease	60,000	75,000
Office Lease	10,000	60,000
DNA synthesis (Avg 0.25/base)	100,000	250,000
Lab equipment (including rapid DNA sequencing equipment)	200,000	75,000
Sequencing	30,000	50,000
Lab reagents and consumables	40,000	80,000
Veterinary Kit development	250,000	50,000
Human diagnostics	0	100,000
Subtotal Lab costs	690,000	740,000
Employees CEO/CSO, Chief Software, Lead Virologist, Lead Automation, Sales	500,000	1,700,000
Non-SAB consulting	200,000	100,000
VC and IP Lawyers	100,000	100,000
Business Services (HR, accounting, etc)	50,000	75,000
Web Development	150,000	150,000
Subtotal human costs	1,000,000	2,125,000
Year Costs Total	1,690,000	2,865,000
Revenue		
Phage Sales	25,000	175,000
Veterinary sales (\$15,000 average)	300,000	7,200,000
Contract development/consulting	100,000	200,000
Year Revenue Total	425,000	7,575,000
Grand Total	-1,265,000	4,710,000