

## Mazen Animal Health

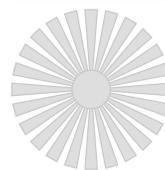
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# MAZEN ANIMAL HEALTH

REINVENTING ANIMAL VACCINES

## Value Proposition

Mazen Animal Health is developing unique oral vaccines with an efficient, cost-effective system appropriate for production, companion & wildlife animals that simplifies dosing management, eliminates cold chain systems and provides a solution for disease prevention and increasing antibiotic use.

## Business Description

**Problem:** The expanding world population is creating pressure on protein suppliers to increase production leading to overcrowding and greater prevalence of animal diseases. Simultaneously, consumers and regulatory bodies are increasing demands to remove antibiotics from routine use.

**Solution:** Mazen is developing oral vaccines to prevent disease with several benefits over existing vaccination practice: efficient, cost-effective source for antigen and vaccine production; oral delivery of vaccine for ease of distribution, administration and compliance; robust mucosal & systemic immune response; and, amenable format for vaccine storage with long shelf life (at least 24 months) at ambient temperature.

## Core Technology / Products

Mazen utilizes an antigen expression platform for the oral delivery of vaccines using maize grain. The corn matrix provides bioencapsulation of the antigens enabling longer availability in the digestive system to reach target cells for the immune response. Mazen is leveraging the vaccine technology and manufacturing experience already developed for other vaccines & proteins enabling high yields that allow for over a million doses per acre. Proof-of-concept demonstrated both immune response and protection against a challenge in several animal species, including swine, with different pathogens. Mazen's first targets will address lactogenic immunity for neonatal diarrhea in pigs, caused by PEDV, E.coli and other agents.

## Market Opportunities

The global animal vaccine market is \$5.4B & expected to reach \$8.6B by 2018. Mazen's 1st development area is swine vaccines, currently a \$1.5B market with 11% growth rate. Our 1st oral vaccine will address PEDV, projected to exceed \$30M in sales 5 years post-launch. The 2nd oral PRRS vaccine is expected to exceed \$50M in sales. Mazen's oral vaccines can save producers over 50% in vaccination costs. Large producers have expressed interest in participating in early testing of these vaccines once produced. Our strategy for sourcing customers is to engage key customers early to gain their insights and involve them in early prototype testing for early buy-in.

## Proprietary Rights

Mazen holds exclusive licenses to ABI IP related to Animal Health. ABI has issued and pending patents on: methods to increase the levels of antigen in the host tissue; methods to process the material to obtain a more robust immune response; license & rights to patents and materials enabling freedom-to-operate; know-how and experience in developing, producing and commercializing recombinant proteins from plants

## Management Team

**Jennifer A. Filbey, Ph.D.**, CEO

**John Howard, Ph.D.**, Chairman

**Vicki Morgan**, Head, Business & Market Development

**Celine Hayden**, Head, R&D

## Year Founded

2015

## Industry

Biotechnology

## Funding to Date

\$500,000+

## Current Investors

Founders

iiM, LLC

A. Terry Speizer Trust

Missouri Technology Corporation

KCAHIF Award

## **Competition / Competitive Advantage**

Injectable vaccines are the key competition. Mazen can easily compete on price and maintain high margins. The oral vaccines can be given to sows, who pass the immunity to the piglets until weaned at which time the piglet can easily take the oral vaccine offering seamless protection for the piglets. There are several plant-based systems for generating proteins and antigens, none enable oral delivery.

## **Strategic Partners / Alliances**

We are seeking strategic alliances with animal health companies to develop antigens of interest. We have begun discussion with several companies and these collaborations coupled with our internal developments enable a rich product pipeline and increase the future revenue stream. We are also pursuing partnerships to leverage public funding such as SBIR grants where the strategic partner will test vaccines developed by Mazen.

## **Management**

### **Jennifer A. Filbey, Ph.D., CEO**

High energy entrepreneur focused on commercializing products which shift treatment paradigms; Founder & President, New Perspectives for 9 years, leading virtual team and working with biotech/pharma companies to commercialize assets, typically first products; VP level positions at start-ups and SpecPharma

### **John Howard, Ph.D., Chairman**

World-leading expert in protein production in maize. Over 35 years experience in directing biotechnology groups for two Fortune 500 companies and two start-up companies. Directed the commercial introduction of several biotechnology products and, the first demonstration of protection from a plant-produced oral vaccine in pigs.

### **Vicki Morgan, Head, Business & Market Development**

Business development and licensing experience spans start-up biotechnology to Fortune 200. Focused on leading business strategy & partnership initiatives, identification of partners, management of the diligence process, term sheet development, and license negotiation.

### **Celine Hayden, Head, R&D**

Over 15 yr experience in R&D - heads the vaccine program at ABI, directs all aspects of research, development, preclinical studies, regulatory compliance, and product development for oral vaccines. PhD in Plant Molecular Genetics from U Arizona & post-doc NIH IRACDA Fellow

## **Financial**

Mazen is seeking funding to facilitate development of oral vaccines from concept through commercialization. The initial close of Mazen's angel round occurred in March, 2017, led by iiM, LLC, A. Terry Speizer, with matching funds from the Missouri Technology Corporation. A final close of the angel round will occur no later than mid-May, 2017. The angel round will enable development of the first vaccines to early animal testing, feedback from Center for Veterinary Biologics on the product development plan, market research with producers to optimize the dosing, and business development activities to establish strategic relationships. The next financing will enable safety & efficacy testing for registration and follow-on vaccine development. Initial revenue will come from strategic collaborations and product revenues are projected in four years. Peak sales of the oral vaccines are based upon gaining a 30% market share. The most probable exit is an acquisition by an animal health company.