



Positive disruption is our mission

Mazen Animal Health, Inc. is a biotechnology company developing and commercializing novel biological vaccines and therapeutics that disrupt the status quo. We believe all animals should be protected from preventable disease, but today that isn't the case. We intend to change that. Building on over 20 years of R&D, our vaccine production platform enables edible vaccines to be delivered with feed. We will disrupt the animal vaccine market in four distinct ways, by providing: (1) cost effective vaccines - removing the economic thresholds that control the vaccination decision today; (2) a safer method of vaccine administration; (3) improved vaccine efficacy; and (4) vaccines with a global reach because of ambient temperature stability and ease of delivery.

Mazen is leveraging a developed platform technology from Applied Biotechnology Institute (ABI) to produce proteins, such as antigens, in maize grain. ABI has significantly improved the expression levels and developed commercial manufacturing processes to make this platform commercial-ready.

Technology & IP:

The platform technology involves expression of antigens in maize grain. These safe subunit antigens provide both mucosal and systemic immunity enabling the potential to be more efficacious than current injectable vaccines. Maize grain containing antigen is ground into meal and formulated into the appropriate dosage form. Mazen has a license, exclusive in animal health, to ABI's portfolio of issued and pending patents and know-how. Mazen will own new IP and has filed a provisional patent for PEDV.

Product Development:

With angel round funding and an NIH grant, we have produced two subunit antigen vaccine candidates – for Joaquin Valley fever and for Porcine Epidemic Diarrhea Virus (PEDV).

Valley fever is a fungal infection that leads to disease not only in humans but also dogs, cats, horses, llamas and alpacas. With 12 million dogs in the southwestern United States and an increasing population of camelids at risk, cases of Valley fever are increasing and can be very costly. The disease can last years and is currently treated with expensive anti-fungal medications. In Arizona alone, it's estimated that Valley fever costs dog owners at least \$60 million per year. It can cause severe lung, spleen and bone infection, often leading to death.

There is no vaccine for Valley fever, in part because the antigen is poorly expressed in microbial systems. We have produced a sub-unit vaccine candidate in maize grain at levels that are a hundred-fold higher than what has been achieved with traditional fermentation. Maize-produced antigen allows for both injectable and chewable formats for vaccination and sub-unit vaccines are considered one of the safest approaches to vaccines. In lab animal testing, the Mazen vaccine elicited a biomarker response correlative with protection and reduced the burden of *Coccidioides*, the fungus that can cause Valley fever.

Porcine Epidemic Diarrhea Virus causes 100% mortality in newborn pigs and can cause significant losses in farrowing barns. In addition, endemic infections slow weight gain in older pigs, extending the time to market. While a conditional PEDV injectable vaccine is available, it has shown limited efficacy and requires labor crews to individually vaccinate each pig, therefore causing low utilization. Mazen has developed a subunit vaccine which can be dosed with feed, creating a cost-effective, safer to deliver solution for producers. Testing of the orally delivered vaccine in young pigs showed high titers of neutralizing antibodies in a challenge study.

Mazen met with the USDA Center for Veterinary Biologics, the regulatory authorities overseeing vaccine registration, and reached agreement on our product development plan and the treatment of this technology as a platform technology.



Market Opportunity:

Global animal vaccine market is over \$7B with double-digit growth in traditional vaccination. Mazen's vaccines offer an opportunity to expand the existing market by increasing the vaccination rates due to cost-effective, safer to use, more efficacious vaccines with global reach.

Based upon current product development plans and the financial projections, Mazen's global revenue is projected to reach \$300M in 2026. The first product will launch in late 2020 with 10 commercial products by 2026 and a rich development pipeline.

Market research with veterinarians from top swine producers has further defined our product profile for the PEDV vaccine. The swine market is focused with 11 producers controlling over 75% of sows in the U.S., making a B2B product launch strategy achievable for a small to mid-size animal health company. Internationally, we will use a key customer strategy to maximize our sales in key geographies, reducing the number of approvals needed to achieve our sales goals.

Valley fever is a regional play in the Southwest of the U.S. and into Latin/South America. We plan to launch in the U.S. and work with a partner in Latin and South America for product launch and sales growth.

Financing History & Plans:

Mazen has raised \$1M in convertible debt rounds which has allowed us to achieve our milestones: expression of antigen, positive meeting with USDA-CVB, affirmative feedback from market research, and positive proof of concept animal studies.

Mazen will kick-off the Equity round in November, 2018. The funding will take us to product commercialization with two lead products 2020/2021 and will allow us to grow a robust pipeline of products. In this position, Mazen would be a candidate for IPO to fund pipeline build and additional commercialization efforts or an M&A with a major animal health company looking to acquire revenue stream and pipeline.

Leadership Team:

Mazen's team encompasses both technical and commercial leadership.

Dr. Jenny Filbey, CEO, high energy entrepreneur focused on commercializing products which shift treatment paradigms; led teams (both virtual and inhouse) and worked with biotech/pharma/animal health emerging companies to commercialize assets

Dr. John Howard, Board Chair, a world leading expert in protein production in maize grain leads the R&D team.

Kerryann Kocher, Marketing, has extensive expertise in swine and poultry marketing, with leadership experience at both Elanco and Bayer Animal Health.

Dr. Tom Overbay, provides both regulatory and production expertise to the team.

Team expansion is planned in Q4-18 with additions of CFO and R&D Director.

Board of Directors: Terry Speizer, MBA; Ronan Molloy, JD; Kelly Lechtenberg, DVM, PhD; John Howard, PhD, Jennifer Filbey, PhD

Advisors: Dick Hesse, Ph.D. K-State; Stephens & Associates; Jack Moyer, MBA

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