



Biotechnology for the betterment of animals

A family-owned approach for keeping animals healthy

Case Story

At Colorado Serum, biotechnology is a four generation, family-owned approach which values the time honored traditions of personal and responsive service, while being on the cutting edge of modern science.

Colorado Serum traces its roots to the early 1900's when Hog Cholera disease was decimating the swine industry in the US. Dr. J.N. Huff moved to Denver, Colorado in 1922 to open a satellite manufacturing plant from the original "American Serum Company" founded in Sioux City, Iowa. Denver's high altitude provided hogs with enriched blood, so Colorado was considered an ideal environment for producing a new antiserum for Hog Cholera. In 1923, the small Denver plant began production, and shortly thereafter separated from American Serum to become Colorado Serum Company. Hog Cholera was eventually eradicated from the United States.

Today, Colorado Serum has expanded to include a full range of large animal biologicals, large animal veterinary instruments, veterinary diagnostics, specialty products, and laboratory reagents. The facility covers 22 acres in Denver and contains all manufacturing as well as administrative offices. Products are marketed and distributed by numerous animal health companies across the globe.

A necessity to mix

Alfa Laval's relationship with Colorado Serum started out of necessity. In 2009, their existing bioreactor mixing system was in need of replacement. After researching all mixing options, they discovered a new magnetic mixing technology, and it was quickly determined that it was the perfect fit. The primary function of the bioreactor which contains the Alfa Laval magnetic mixer is to produce a vaccine for Leptospirosis. Made at Colorado Serum, the vaccine aids in



Colorado Serum magnetic mixer benefits:

Levitating design

– provides better scale-up capabilities by allowing cultures to freely flow and prosper

8-wing impeller – along with the impeller wing shape, it eliminates cell shearing while allowing cultures to move and reproduce faster

Variable mixing speeds – mixing starts at a very low RPM, even when the bioreactor is empty, and can gradually increase while easily introducing aeration to help achieve higher cell counts

Decreased mixing time – allows for an overall mixing time decrease in each batch – i.e. more cell growth in less time



the prevention of the organism called *Leptospira* from infecting farm animals across the US and even worldwide.

Leptospirosis, or Lepto for short, is a bacterial disease that is transmitted through the urine of wildlife animals such as skunks and raccoons. Once other animals ingest or inhale that urine, it is easily transferred to farm animals such as cattle or swine. As soon as the Lepto bacterium enters the animal's system, it can cause abortions, as well as kidney and liver failure and ultimately kill both cattle and swine if left untreated. Furthermore, it can be a widespread disease if not controlled via this bacterin based vaccine. This bacterium is also a zoonotic organism that can cause disease in humans as well.

The science behind bioreactor mixing

More than just blending ingredients, Colorado Serum considers bioreactor mixing a scientific, dynamic process where organisms are growing 24/7 throughout the mixing process. The step-by-step process begins with initial media and organisms entering the bioreactor to create the vaccine. Mixing always starts at a very low RPM – allowing the organisms to acclimate to their new controlled environment.



Via a series of gradual aeration additions and RPM increases, the biological growth accelerates greatly – monitored by sampling and observing organism counts on a per-millimeter basis.

Mixing with return in mind

Since installing the mixer in 2009, Colorado Serum has been mixing with greater levels of return. Annie Ewing, Staff Microbiologist at Colorado Serum elaborates, “My organisms are highly aerobic and require the correct amount of oxygen at the right time to grow. We’ve found that both the mixer and proper introduction of air over increments of time is the perfect combination to increase growth to levels never seen before at Colorado Serum. Specifically, the Alfa Laval mixer has allowed us to generate a greater cell count which equates to more doses and vaccines that we can sell. It’s amazing because we are now greatly improving our output where we consistently see a 30-50% increase in cell count – attributed solely to the mixer.”

The Colorado Serum mission and future

Colorado Serum is constantly challenging themselves

About Colorado Serum

Year established: 1923

Ownership: family owned, four generations

Number of employees: 100

Markets they reach: Worldwide

Number and types of serums, vaccines produced: Between 80-90 products from serums to toxoids

Exclusively Colorado Serum

- The first biotechnology company to put Lepto 5-way on the market
- The exclusive US producer of Anthrax spore vaccine and RB51, Case-bac, Caseous DT, Blue tongue, and Ram Epididymitis bacterin and West Nile Virus Antiserum.

to find new ways to improve their product. For example, combining research with process improvements to create a more effective vaccine, as well as improving yields. On the process side, their next improvement will be installing a CIP bioreactor process. Annie elaborates, “Our strive for improvement makes us want to take it further. We’ve gone from 50% yield improvements, and know by working with our process, that it can be improved further – maybe 75% is next?”

The continual betterment of current products is considered more than process improvement at Colorado Serum – it’s part of their culture. Annie explains, “Colorado Serum has the unique honor of being one of the few family-run BioTech companies left in the US, which I’m proud to say defines our culture. At the same time, we’re all focused on our jobs for the right reason – for the health of animals and peace-of-mind for all ranchers and farmers.” She concludes, “If I had to sum it up, we’re dedicated to the betterment of animals and everyone that works with them.”

ESE01959 1011

How to contact Alfa Laval

Contact details for all countries are continually updated on our website. Please visit www.alfalaval.us to access the information directly.