

VERENIUM TECHNOLOGY FACT SHEET

NATURE'S SPARKPLUGS: THE POWER OF ENZYMES

Enzymes are specialized proteins that accelerate (catalyze) chemical reactions and are essential in all living systems. Without enzymes, biological processes would occur much too slowly to sustain life. Enzymes are so powerful that one single enzyme can process a million molecules every second.

Microbes, such as bacteria or fungi, are abundant sources of unique enzymes and can be found in almost every ecosystem. Through billions of years of natural selection, microbes have developed broad and varied characteristics which allow them to survive in extreme and diverse environments. Through bioprospecting, Verenum has tapped into the vast genetic resources of the microbial world by venturing into diverse ecosystems, such as volcanoes and deep sea vents. Because the harsh

temperatures and pH conditions in which these "extremophiles" live often mimic conditions found in today's industrial processes, extremophilic microbes represent a valuable source of potential enzyme products.

Verenum harnesses the power of these enzymes through patented discovery and DirectEvolution® technology platforms to create novel, high-performance enzyme products that transform industrial processes.

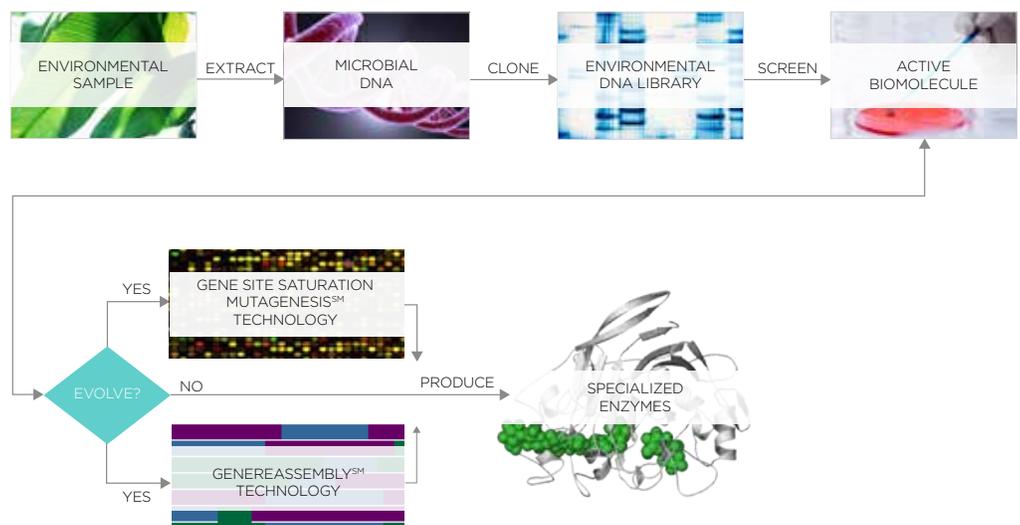
DISCOVERY: UNPRECEDENTED PATENTED CAPABILITIES

Traditional culturing methods provide access to less than 0.1% of the biodiversity in an environmental sample. By contrast, Verenum's approach captures huge collections of microbial genes, termed gene libraries.

Ultra High-Throughput Screening Platform, Capable of Screening One Billion Samples Per Day

Verenum has developed and patented an array of automated, ultra high-throughput screening technologies to mine its large libraries for novel biomolecules.

One example of Verenum's technologies includes the GigaMatrix® ultra high-throughput screening platform. This proprietary screening platform is capable of screening one billion clones per day through the use of state-of-the-art robotics to identify novel enzymes and proteins from gene libraries.



DIRECTEVOLUTION® TECHNOLOGY: IMPROVING ENZYMES FOR TARGETED INDUSTRIAL APPLICATIONS

Verenium has developed a suite of patented, state-of-the-art gene evolution technologies that enable rapid optimization of proteins for use in a wide range of industrial processes. These DirectEvolution® technologies provide significant competitive advantages, including the most comprehensive and non-biased gene evolution platform, the ability to make subtle changes across an entire gene and the freedom to recombine the widest variety of genes with ultimate precision. The patented DirectEvolution® technologies allow us to tailor enzymes to our customer's processes, delivering superior performance and value.

Complementary patented methods lie beneath the DirectEvolution® platform:

Gene Site Saturation MutagenesisSM (GSSMSM) Technology

Verenium's patented GSSMSM technology rapidly generates protein variants by incorporating any or all of the 20 possible amino acids at every position along a protein's sequence allowing all possibilities to be screened for improved properties. From our experience, often just a few amino acid changes can result in proteins with significantly improved characteristics such as temperature stability, pH stability, increased reaction rate or resistance to deactivating chemicals.

GeneReassemblySM Technology

Verenium uses GeneReassemblySM technology to optimize the characteristics of proteins by combining the best properties of candidate genes into a new, high-performance molecule. GeneReassemblySM technology enables us to create complete combinatorial libraries from a variety of different genes and can be an excellent complement to GSSMSM technology.

Tailored MultiSite Combinatorial Assembly (TMSCASM) Technology

Verenium's patent pending TMSCASM technology taps into a wealth of protein evolution possibilities. TMSCASM is a tool we use to explore combinatorial diversity of more than one mutation at multiple specific sites simultaneously.

GENE EXPRESSION CAPABILITIES: WORLD LEADER IN HETEROLOGOUS EXPRESSION IN BACTERIA AND FUNGI

Since our approach to enzyme discovery does not involve culturing organisms from an environmental sample, our lead enzymes usually come from unknown organisms. Over the last 15 years, we have developed the requisite skills to perform heterologous expression and through the systematic application of a wide range of bacterial and fungal expression technologies, we are able to express novel genes at high levels, providing a basis for low cost commercial production.

PROVEN PRODUCT PORTFOLIO: DEVELOPED USING VERENIUM STATE-OF- THE-ART TECHNOLOGIES

FUELzyme[®]
ALPHA-AMYLASE

phyzyme XP

PYROLase[®]
CELLULASE

XYLathin[®]
XYLANASE

LUMINase[®]
PB-100 XYLANASE

ERADICake[™]
ALPHA-AMYLASE

COTTONase[®]
PECTATE LYASE

For more information visit
www.verenium.com

