

## Proviaera Biochemicals vs. Enzymes

### *Application, differences, and synergies*

#### **Background Description**

Enzymes are types of metabolites that have been extensively used in the leather-making process since the beginning of the XX<sup>th</sup> century, when Dr. Otto Rohm first tapped into this technology and began using pancreatic extracts in the bating operation. Over the years, knowledge of enzymes has been further developed. As such, chemical suppliers of the leather industry are now able to offer several enzymes with specific features that can be used in several stages, other than bating. Enzymes can now also be applied in the soaking, unhairing, and degreasing processes.

Enzymes are obtained through the biotechnological processes of microbial fermentation. These enzymes have complex molecules that are harnessed because of their specific catalytic properties. They do not chemically combine with the collagen structure of hides and skins or other chemicals, but accelerate degradation of protein and fats that become soluble. They are also easily removed when draining the floats.

#### **Proviaera Technology**

Proviaera biochemicals are metabolites derived from a fermentation process of natural selected raw materials and probiotics. The organic molecules from these raw materials break down, maintaining their functional groups. These groups are responsible for conferring specific properties that are useful during leather processing. Such properties, namely hydrating, solubilizing, dispersing, and degreasing, can replace chemical or biological auxiliaries like surfactants and enzymes. Alternatively, such properties can synergistically improve the performance of traditional auxiliaries. This application has a positive impact on effluent pollution. Furthermore, the probiotic nature of Proviaera's biochemicals eliminates the need for biocides in pre-soaking and soaking processes.

The soaking process aims to rehydrate hides and skins and to clean off dirt, manure, blood, unstructured proteins, and other non-leather-making substances that are not suitable to be converted into leather. The products used in the soaking process have to open up the febrile structure of collagen and allow the penetration of the tanning products that stabilize the protein from biological decomposition. An effective soaking process will also facilitate a more efficient uptake of the other leather chemicals that confer properties to the final leather articles, making them a valuable final material.

Hides and skins contain an adipose tissue composed of insoluble fats. The degreasing process aims to remove greasy substances from hides and skins that have to be eliminated or dispersed uniformly throughout the leather. It consists of three different phases. The first step cleaves off fats from the hide and skin structure. The second stage disperses the fat in the water float, and the third step solubilizes fats by emulsification or hydrolysis. Enzymes break down fats, converting fats into soluble fatty acids.

**Application Properties: Main Differences**

	<b>Proviaera Biochemicals</b>	<b>Enzymes</b>
<b>Origin</b>	Natural/Biotechnology	Natural/Biotechnology
<b>Application</b>	Easy and safe	Strict controls of application conditions such as pH, temperature, and time. Allergenic and require protective working material.
<b>Range of effective pH</b>	2-14	Specific pH range
<b>Risk of overdosing</b>	None	Strong effect on leather quality
<b>Operating mechanisms</b>	Cleave off / dispersing	Catalyst (accelerate hydrolysis/solubilization)
<b>Molecule size</b>	Small	Big
<b>Penetration Efficiency</b>	High	Poor
<b>Environmental impact</b>	None – positive	None
<b>Application efficiency (capability to reduce other chemicals)</b>	Excellent	Excellent
<b>Cleaning effect</b>	Inside	Superficial
<b>Application processes</b>	All tanning operations	Soaking, unhairing, bating, degreasing
<b>Compatibility with other leather chemicals</b>	Good	Limited

**Application Properties: Potential Synergies**

	<b>Proviaera biochemicals</b>	<b>Enzymes</b>
<b>Soaking</b>		
Penetration	***	0
Protein & dirt removal	**	**
Collagen hydration	***	**
Opening fibers	***	*
Inner cleanness	***	*
Grain cleanness	*	***
Efficiency (no other auxiliaries are needed)	***	0
<b>Degreasing</b>		
Cleave off fat from hides & skins	***	0
Fat dispersion	***	0
Fat emulsion/hydrolysis	0	***
Need of surfactants	No-ionic emulsifier	Ionic surfactant

\*\*\* Excellent

0 Poor