BP—Triluronic™ Acid
a potent combination of select fractions of hyaluronic acids

INCI Name: Water (and) Sodium Hyaluronate

Key Benefits:
- Makes skin supple and receptive
- Hydrates the skin
- Enhances performance of other ingredients
- Offers barrier repair
- Aids in proliferation of keratinocytes

Background
Hyaluronic Acid (HA) occurs naturally in all vertebrate tissues and throughout the body in various connective tissues, synovial joint fluids, and in varying amounts in the skin. It is in the skin that the body holds the primary reservoir of HA — up to 50% of the total.

Because of its unique rheological, viscoelastic and hygroscopic properties, HA plays a pivotal role in protecting, stabilizing, and reinforcing skin at the cellular level. Hyaluronic Acid, along with collagen, elastin, and essential lipids form the primary elements of human skin matrix.

Native Hyaluronic Acid is naturally produced by skin cells mainly in varying concentrations of low molecular weight polymers (15 kDa), all the way through to high molecular weight polymers (up to 2,000 kDa). The size of the polymer dictates its biological role in the skin and its primary benefit.

Introduction
BP—Triluronic™ Acid is produced through fermentation and then by carefully cleaving high molecular weight hyaluronic acid into smaller fractions of three different molecular weights specifically tailored to optimize performance in skin care. The balanced ratio of high, medium, and low molecular weight fractions is designed to target different layers of the skin from the surface through the epidermis and dermis.

Typical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance @ 25°C</td>
<td>Clear liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Mild, characteristic</td>
</tr>
<tr>
<td>pH (@ 25°C)</td>
<td>6.0 – 8.0</td>
</tr>
<tr>
<td>Viscosity @ 25°C, cps Brookfield LV SP#63 @ 10RPM</td>
<td>200.0 – 2000.00</td>
</tr>
<tr>
<td>Loss on Drying</td>
<td>98.0% min.</td>
</tr>
<tr>
<td>Microbial Content</td>
<td>&lt;100 opg, no pathogens</td>
</tr>
<tr>
<td>Recommended Use Level</td>
<td>1 – 3%</td>
</tr>
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</table>

Product Applications:
- Skin care creams and lotions
- Facial toners and toner pads
- Cleansers
- Color cosmetics containing water
Specifics

**BP–Triluronic™ Acid**'s high molecular weight fraction has a range of ~1500 kDa to ~2000 kDa. This High MW HA is primarily used to hydrate the skin, for barrier repair function, for firming, lifting, and for soothing and moisturizing dry skin. **BP–Triluronic™ Acid**'s mid-molecular weight fraction has a range of ~300 kDa to ~500 kDa. Mid Molecular Weight HA penetrates deeper into the stratum corneum and stimulates corneocyte differentiation and protection of skin's NMF (Natural Moisturizing Factor), making it the ideal ingredient to restore moisture where it is most needed and to aid against inflammation and irritation (both natural and introduced), and to heal sensitive dry, damaged skin. **BP–Triluronic™ Acid**'s low-molecular weight fraction has a range of ~12 kDa to ~15 kDa. Low molecular weight HA penetrates deeper into the epidermis and upper layer of the dermis and into the narrow extracellular space between the stratified keratinocytes layers to induce production of native HA and to aid in proliferation of the keratinocytes.

HA is most abundant in young healthy skin—it is most plentiful in infancy and adolescence and decreases as we age. Typically, by mid-life span (42 years of age to 47 years of age), native production of HA is halved and continues in a sharp decline as we age. This loss of HA production and the resulting loss of moisture retention capabilities in the skin is one of the key primary contributors to the appearance of dry sagging skin and to the loss of skin firmness, radiance, and elasticity.

**Why BP–Triluronic™ Acid?**
The most significant value-add of **BP–Triluronic™ Acid** over standard fractions of hyaluronic acid is its ability to enhance performance in formulations and also enhance performance of other actives by working broadly across all layers of the skin. **BP–Triluronic™ Acid** synergistically deploys its specific benefits to the epidermis and dermis, making the layers more available and receptive to the beneficial effects of all skin care actives. The increased hydration and enhanced penetration optimize the desired effects of active ingredients for a slew of targeted skin care remedies including hyperpigmentation issues, dark circles issues, fatigued sagging skin issues, and damaged compromised care remedies.

**BP–Triluronic™ Acid** offers significant value over the intrinsic benefits of standard hyaluronic acid by boosting the care in skincare.
Clinical Studies
It is well established in the scientific literature that hyaluronic acids (HA) of different molecular weights (MW) have different effects on the skin. Pavicic, et. al.\textsuperscript{1}, performed a clinical study on 76 subjects comparing formulations containing 0.1% of low (50-130 kDa), middle (300-800 kDa), and high (2,000 kDa) MW HA and evaluated their effects on skin hydration, elasticity, and wrinkle depth. Their results are summarized in the following chart:

Results
The results indicate that low MW HA should be best for skin hydration, with some activity from medium MW HA. For elasticity, medium MW HA should have the highest activity, with some activity from low and high MW HA. For average wrinkles, medium MW HA was best, while for deep wrinkles low MW HA was best.

Sundaram, et. al.\textsuperscript{2}, have published a paper comparing low and high MW HA using human skin explants. They applied aqueous gels containing 0.075% HA to the surface of the skin explants daily and measured transepidermal water loss (TEWL) after 2 days. They report that TEWL was lowered by 15.6% for the explants treated with high MW HA, while the TEWL increased by 55.5% for the low MW HA treated group. This indicates that high MW HA should have the best effect for lowering TEWL of the skin.

The results of these two studies are summarized in the following table along with a summary of how BP–Triluronic™ Acid should combine the effects of three molecular weights of HA to give improved performance.

<table>
<thead>
<tr>
<th></th>
<th>Hydration</th>
<th>Elasticity</th>
<th>Avg. Wrinkles</th>
<th>Deep Wrinkles</th>
<th>TEWL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low MW HA</td>
<td>++</td>
<td>+</td>
<td></td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Medium MW HA</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td></td>
<td></td>
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<tr>
<td>High MW HA</td>
<td>+</td>
<td></td>
<td></td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>BP–Triluronic™ Acid (predicted)</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
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</tbody>
</table>

In contrast to the individual HA MW fractions, by combining low, medium, and high MW hyaluronic acid, BP–Triluronic™ Acid should be able to take advantage of the best properties of each of the HA fractions to give finished products high efficacy over all of the desired skin properties.

References
JEEN International is the exclusive distributor for BotanicalsPlus in the Personal Care Industry.