Immediate and sustained skin hydration
PatcH2O™: Rapid and lasting hydration

KEYWORDS: Hydration, immediate effect, pullulan, alginate, hyaluronic acid.

Abstract
PatcH2O™, BASF’s skin moisturizer, is based on highly developed liquid patch technology for the controlled release of moisturizing factors. Its unique combination of pullulan, alginate, and hyaluronic acid, forms a molecular network that acts as a protective film and reduces water evaporation on the skin’s surface. The micromesh contains a complex made up of glycerin, L-serine, trehalose, and urea. These natural moisturizing factors are gradually released into the upper layer of the epidermis – the stratum corneum – rebalancing its moisture levels. The ‘anti-thirst’ ingredient’s efficacy has been demonstrated in various in-vitro and in-vivo studies.

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The secret to beautiful, bright, luscious, and healthy skin lies in its hydration levels. Dry, dehydrated skin is a very common problem in modern life, affecting people of all ages, and it is characterized by increased skin roughness and tightness, fine lines, as well as discomfort and a lack of suppleness. A primary objective in skincare is to ensure the upper layer of the epidermis – the stratum corneum – remains optimally hydrated. This, in turn, allows the skin to retain its flexibility and smoothness for as long as possible, while preserving its youthful appearance.

PatcH2O™ targets two different moisturization needs
Although one out of three treatments on the market makes hydration claims, very few products efficiently give the skin both immediate and sustained hydration. Combining two areas of expertise - natural macromolecular and controlled release technology - BASF Beauty Creations has developed an active ingredient, PatcH2O™ (INCI Name: Water, Glycerin, Trehalose, Urea, Serine, Pentylene Glycol, Glyceryl Polyaclrate, Algin, Caprylyl Glycol, Sodium Hyaluronate, Pullulan, Disodium Phosphate, Potassium Phosphate). PatcH2O™ is a molecular network of natural biopolymers (hyaluronic acid, alginate, and a natural glucan known as pullulan) with a high concentration of a moisturizing complex containing glycerin, serine, trehalose, and urea. PatcH2O™ targets two levels of moisturization: The molecular mesh forms a protective layer on the skin’s surface. At the same time, the moisturizing complex is slowly released into the stratum corneum, rebalancing moisture levels. PatcH2O™ decreases trans-epidermal water loss and strengthens the skin’s barrier function, ensuring sustained hydration for more than 48 hours after a single application. Additionally, PatcH2O™ is easily formulated and feels silky on the skin. It is suitable for all skincare applications claiming immediate skin hydration, as well as for dry skin treatments and use in anti-ageing skincare ranges.

Efficient combination of three polysaccharides
The molecular mesh in PatcH2O™ is a combination of three polysaccharides - pullulan, alginate, and hyaluronic acid - each of which brings specific physiochemical properties (Figure 1).

**Pullulan**
Pullulan is a linear polysaccharide made up of repeating maltotriose units (poly-α-1,6-maltotriose). Its polymeric structure lends it unique gelling, adhesive, and film-forming properties. Pullulan also has antioxidant benefits which, in combination with collagen, can enhance the survival of stem cells placed under high oxidative stress and keep them in their pluripotent state for longer [1]. The natural ingredient is produced through the bio-fermentation of a food-grade starch hydrolyzed with non-GMO and non-toxic strains of the
Aureobasidium pullulans fungus. Pullulan has been sold as a food additive in Japan for more than 20 years, while the FDA has certified it as a safe food ingredient.

**Alginic acid** is a polymer of D-mannuronic and L-glucuronic units obtained from brown algae (*Phaeophyceae*) by basic hydrolysis. Long used as bulking agents in pharmaceuticals for their gelling, stabilizing and film-forming qualities, alginate gels have an ideal porosity that allows them to trap small molecules while maintaining their free diffusion inside and outside a gel [2]. Associated with certain drugs, alginate regulates the rate and kinetics of absorption of active ingredients. In recent years, **hyaluronic acid** has emerged as the most popular category of injectable wrinkle fillers. This hygroscopic molecule can hold up to 1,000 times its volume in water [3].

**Proof of concept**
If the composition of PatchH2O™ is already unique in itself, the real innovation lies in its performance: its short, medium and long-term hydration capabilities. The efficacy of PatchH2O™ has been demonstrated in-vitro by an Aqua-guard test, and dielectric conductivity measurement. Hydration measurements by corneometry on the forearm and on the face confirms also its in-vivo activity.

**Aqua-guard test**
The ability of PatchH2O™ to limit water evaporation was tested using an accelerated evaporation test on synthetic skin (Vitro-skin®), compared to its moisturizing complex alone (PatchH2O™ without polymers). Standard amounts of PatchH2O™ and its moisturizing complex were applied to test pieces of Vitro-skin®. Vitro-skin® is a mimetic artificial skin substrate used in many cosmetic tests. With the same topographies, pH ionic strength and critical surface tension as human skin. Ten trials were prepared for each product. The treated synthetic skins of 3 cm² were dried in a thermo-regulated oven for 1 hour at 45°C, then placed on containers filled with water. The treated and processed skins were then placed back into the oven, which was heated to 45°C for fast evaporation. After 48 hours, the containers were weighed to measure the water loss and calculate the Aqua-guard capability of PatchH2O™ (amount of water evaporated over the time) versus the moisturizing complex. The results showed that the skin trials treated with PatchH2O™ retained significantly more water than the pieces treated with the moisturizing complex only (+317%, p<0.001). PatchH2O™ therefore reduced water evaporation from Vitro-skin® models over a 48-hour period, which can be attributed to its unique combination of protective film-forming polymers.

**Measurement of dielectric conductivity**
The ability of 3% PatchH2O™ to deliver intense moisturization after 30 minutes, and for up to 48 hours, was demonstrated on human skin biopsies – again versus its moisturizing complex. The study was conducted with human skin explants from plastic surgery. Epidermal sheets were prepared by peeling of the dermis after heating at 60°C for 2 minutes. The stratum corneum was isolated by enzymatic digestion as described in the publication of Rochefort and al [4].

The epidermal sheets were put in an oven at relative humidity of 44% and were then treated with each hydrogel (three consecutive applications each 30 minutes). Dielectric conductivity measurement were carried out prior to treatment and then up to 48 hours after the third application [5].

The results of the application of PatchH2O™ and the moisturizing complex were expressed as a percentage increase in the skin’s dielectric conductivity compared to the application of hydrogel alone (control). The results showed that PatchH2O™ formulated at 3% in a hydrogel significantly increased dielectric conductivity in the stratum corneum compared to hydrogel containing the moisturizing complex at 3% - and this from 30 minutes up to 48 hours after application. Furthermore, 48 hours after treatment, the moisturizing power of PatchH2O™ was on average 1.6 times that of the moisturizing complex alone.

**Clinically proven efficacy**
The efficacy of PatchH2O™ has been clinically proven against a placebo on human skin. The results showed instant moisturizing effect (30 minutes after application) and sustained action (up to 48 hours, even after a single application) and a remarkable moisturizing capital: PatchH2O™ maintained skin hydration for up to five days after application.

**Express hydration that continues**
In the first clinical study, PatchH2O™ was tested on 22 female volunteers aged 18 to 65 years old with a tendency for dry skin (40 ua in corneometry or less). A cream containing 3% PatchH2O™ (Table 1) and a placebo cream (Table 2) were applied to the forearm. The unique and standardized application of product (approximately 40µl) was performed by an experienced technician in a room with controlled temperature and relative humidity. The hydration improvement versus pre-treatment was measured via corneometry (in triplicate on each site) at baseline and at 30 minutes, 4, 8, 24 and 48 hours after the single application. For 3% PatchH2O™, hydration measures were statistically significant compared to the baseline at all times from 30
containing 3% Patch\textsubscript{H2O}™ (Table 1) was applied twice daily on one hemi-face, and a placebo cream (Table 2) on the other by the volunteers, at home. On the morning of day 21, application was stopped and no cosmetics were applied at all for five days. To evaluate the moisturizing effect’s longevity, it was measured two and five days after the final application with corneometry in triplicate at each site on the cheeks.

The placebo formulation yielded no significant moisturizing effects compared to the baseline (+14% and +12% versus baseline at times T23 and T26, respectively). By contrast, the test product showed a significant long-term moisturizing effect two and five days after the final application, both compared to the baseline (+80% and +38% versus baseline at times T23 and T26 respectively, p<0.05) and the placebo (+66% and +26% respectively, p<0.1).

CONCLUSIONS

Patch\textsubscript{H2O}™ is an ‘anti-thirst’ moisturizing ingredient with a triple moisturizing effect - immediate (30 minutes), long-term (48 hours), and sustained (five days). It is studied to restore and maintain hydration of the stratum corneum, working as a skin moisturizing active for producing immediate, visible results. Therefore, Patch\textsubscript{H2O}™ is suitable for use in all skincare products claiming immediate effect and lasting moisturization, and can also be used in dry skin treatments as well as anti-ageing products.

REFERENCES


Table 1. Cream formulation with Patch\textsubscript{H2O}™ at 3% (caption) Table 2: Placebo formulation.

Table 2. Placebo formulation.

Figure 4. Hydration improvement in vivo (forearm) versus pre-treatment over 48 hours for 3% Patch\textsubscript{H2O}™ against a placebo, measured via corneometry.

Figure 5. Hydration improvement in vivo (hemi-face) versus pre-treatment after 21 days of treatment using 3% Patch\textsubscript{H2O}™ versus placebo, measured by means of corneometry.
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Finding derived from a representative TNS market survey.