PENTAVITIN®
Feel deep hydration for 72 hours
Agenda

1. Insights into current consumer trends
2. DSM PENTAVITIN®

PENTAVITIN®
Feel deep hydration for 72 hours
Trend: Pure & Elegant Performance Moods

Water-like surfaces, organic shapes and the importance of light
Trend: Pure & Elegant Performance Consumers Lifestyle

- **Inspiration:** water
- **Style:** elegant and sophisticated
- **Belief in science and wish to solve nature’s mysteries**
- „Green“ attitude means: mindful need for change, combination of nature and science/technology
- **Need:** individual and premium products that perform
- **Individuality focus:** something special for me
Dry skin affects millions of people

- Moisturising/hydrating skin remains the central function of face, neck, body, hand, foot care products with 77% of launches positioned to provide this benefit.

- 17% of products launched featured the long-lasting claim

- 26% of products launched featured the instant claim

(Mintel report, July 2011).

- Dry skin is nature’s way of warning you that the protective elements of your skin barrier is not working properly anymore
**Dry skin:**

impaired healthy skin appearance

<table>
<thead>
<tr>
<th>Area</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>- softness</td>
</tr>
<tr>
<td></td>
<td>- smoothness</td>
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<tr>
<td></td>
<td>- flakiness</td>
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<tr>
<td></td>
<td>- robustness</td>
</tr>
<tr>
<td></td>
<td>- tightening</td>
</tr>
<tr>
<td>Body</td>
<td>- softness</td>
</tr>
<tr>
<td></td>
<td>- smoothness</td>
</tr>
<tr>
<td></td>
<td>- flakiness</td>
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<td></td>
<td>- itching</td>
</tr>
<tr>
<td>Hand</td>
<td>- smoothness</td>
</tr>
<tr>
<td></td>
<td>- softness</td>
</tr>
<tr>
<td></td>
<td>- flakiness</td>
</tr>
<tr>
<td></td>
<td>- robustness</td>
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<td></td>
<td>- tightening</td>
</tr>
<tr>
<td>Feet</td>
<td>- smoothness</td>
</tr>
<tr>
<td></td>
<td>- flakiness</td>
</tr>
<tr>
<td></td>
<td>- robustness</td>
</tr>
</tbody>
</table>

uncomfortable skin feeling
Stratum corneum (SC) is the driest skin layer in the skin

- **S. corneum**
  - Water content: 10 - 20 cell layers
- **S. granulosum**
  - Water content: 1 - 3 cell layers
- **S. spinosum**
  - Water content: 5 - 8 cell layers
- **S. basale**
  - Water content: 1 cell layer

Water content:
- 70%
- 65%
- 35%
- 20%
- 10%
Stratum corneum and stratum granulosum

The stratum corneum consists of corneocytes and intracellular lipids.

A corneocyte can hold large amounts of water within the cell.

Each corneocyte is surrounded by a cornified cell envelope. Main component is loricrin.

The junctions that hold the corneocytes are the corneodesmosomes.

Desquamation is the process of cell shedding from the surface of the stratum corneum.

NMF is a collection of water-soluble compounds (e.g. sugars, amino acids), that protect skin against dehydration.

Filaggrin is the precursor protein for the amino acids derived components of the NMF.

In the stratum granulosum the lamellar bodies are formed. The lamellar bodies release lipids (e.g. ceramides)
What „moisturizers“ need to do?

- **Short term**: Increase SC hydration
- **Medium term**: Improve desquamation
- **Long term**: Strengthen barrier function

comfortable skin feeling & healthy skin appearance

JM Crowther et al.
BJD 2008
Agenda

1. Insights into current consumer trends

2. DSM PENTAVITIN®
PENTAVITIN®
ECOCERT approved and NATRUE certified

- **INCI**
  Saccharide Isomerate (active)
  Aqua, Citric Acid, Sodium Citrate

- **Preservative free**

- **Appearance:**
  clear, yellowish to slightly amber
coloured, slightly viscous liquid

- **Certification**

PENTAVITIN®
Ecocert approved
100% Natural Origin
0% Plant Ingredient

Raw material approved by Ecocert Greenlife according to the Ecocert Standard
for Natural and Organic Cosmetics available at http://cosmetics.ecocert.com

PENTAVITIN®
2% Natural (0% Organic)
48% Water
50% Derived natural
0% Nature-identical

Complies with the NATRUE Criteria.

- **Strong focus on sustainability and quality**
PENTAVITIN®
Unique composition

<table>
<thead>
<tr>
<th>Compound</th>
<th>Carbohydrate fraction of the SC</th>
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</thead>
<tbody>
<tr>
<td>Psicose</td>
<td>0.2</td>
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<tr>
<td>Glucose</td>
<td>2.2</td>
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<tr>
<td>Mannose</td>
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<tr>
<td>Fructose</td>
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<tr>
<td>Glucose</td>
<td>46.7</td>
</tr>
<tr>
<td>Galactose</td>
<td>2.1</td>
</tr>
<tr>
<td>Various</td>
<td>14.7</td>
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</tbody>
</table>

PENTAVITIN®’s composition is very similar

- Unique composition similar to that of the carbohydrate complex (NMF) found in human skin
- Derived from plant based D-glucose
PENTAVITIN®

Mechanism

Desquamation
- NMF
- Cornified envelope
- Hyaluronan
- Ceramides

Water retention
- Binding to keratin

Stratum corneum hydration

PENTAVITIN®

short term

mid term

long term

Flakiness
- Tightness

Epidermal barrier
- Softness
- Smoothness

Itchiness
- Stinging

comfortable skin feeling & healthy skin appearance

Pages: 15, 18

Page: 14

Pages: 15 + 19

Pages: 20 - 21

Page: 13
• Unique binding mechanism to the skin that is not washed off

• The removal of PENTAVITIN® occurs only by the natural process of desquamation

• Proven binding to amino acid lysine (free ε-amino groups) at the corneocytes

**PENTAVITIN®**

Stimulates key genes playing a role in the skin barrier

<table>
<thead>
<tr>
<th>Gene Expression Level</th>
<th>Filaggrin (NMF)</th>
<th>Hyaluronan synthase 3 (Hyaluronan)</th>
<th>Loricrin (Corneified envelope)</th>
<th>Acid sphingomyelinase (Ceramides)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>500</td>
<td>100</td>
<td>400</td>
<td>300</td>
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</tbody>
</table>

PENTAVITIN® upregulates the filaggrin, loricrin, hyaluronan synthase3 and acid sphingomyelinase gene expression levels
PENTAVITIN® - in-vivo Efficacies

Study details

- 12 female subjects, 40±1 y
- Evaluated skin area: calf
- No application of cosmetics
- Standardized shower gel

- 1% aqueous PENTAVITIN
- Twice daily application
- Measurements before and after 4w treatment phase:
  1. Clinical grading according to Kligman
  2. Barrier disruption induced by tape stripping
     Assessment of barrier repair by TEWL
  3. Macrophotographs
  4. Questionnaire before and after 2w & 4w treatment phase

- Measurements and clinical grading 3d (72 hours) & 6d after treatment phase

<table>
<thead>
<tr>
<th>2 weeks</th>
<th>T₀</th>
<th>4 weeks</th>
<th>T₄W</th>
<th>6 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash out phase</td>
<td>Treatment phase</td>
<td>Regression phase</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No application of PENTAVITIN
1% PENTAVITIN® reduces dry skin signs by 20% after 4 weeks according to Kligman’s clinical grading. After the last treatment the effects of PENTAVITIN® last for 72 hours.
1% PENTAVITIN® strengthens skin barrier function shown by 20% reduction in TEWL before and after 20 subsequent tape stripplings after a 28 day application.
PENTAVITIN® - in-vivo Efficacy

Significant improvement in desquamamtion

- Macrophotographs demonstrating significant improvement in skin appearance after 4 weeks application of 1% PENTAVITIN®

- Stratum corneum desquamation has clearly been normalized.
PENTAVITIN® - in-vivo Efficacy

Improves a comfortable skin feeling & a healthy skin appearance

Consumer panel testing confirms after 2 weeks that 1% PENTAVITIN®

• improves skin softness and smoothness by more than 50%
• reduces flakiness by more than 50%
• reduces itchiness by more than 50% and tightening by more than 30%
• improves skin robustness by more than 20%
# PENTAVITIN® - in-vivo Efficacies

## Study details

<table>
<thead>
<tr>
<th>1 week</th>
<th>2 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash out phase</td>
<td>Treatment phase</td>
</tr>
</tbody>
</table>

- female subjects, 35-55 y
- No application of cosmetics

**1. Skin Hydration Test**
- Static test, provides information about the skin hydration
- Measurements before/after 2 weeks treatment
- Evaluated skin area: calf (= dry skin); volar forearm (= normal skin)

**2. Moisture Accumulation Test (MAT)**
- Dynamic test, provides informations about the hydration retention capacity of skin
- Measurements after 2 weeks
- Evaluated skin area: forearm

**Test formulations:**
- a) 5% PENTAVITIN® containing cream
- b) 6% Glycerin containing cream

**Application:** twice daily
**Test device:** NOVA DPM 9003
PENTAVITIN® - in-vivo Efficacy
Instant deep hydration

PENTAVITIN® retains instantly more moisture in the skin than glycerin
5% PENTAVITIN® outperforms 6% glycerin significantly after a 14-day application

- by 43% more hydration on dry skin and
- by 42% more hydration on normal skin
**Anti-Irritant test:**

- 12 female volunteers, aged 40 to 60 with normal to dry and slightly sensitive skin

- Formulation containing 5% AHA (lactic acid) with and without 5% PENTAVITIN®, pH 3.0

- Application on the left and right sides of their faces, during four weeks

- Measurements at day 0, 5, 10, 15, 20, 25 and day 28

- Efficacy evaluated with stinging scores

PENTAVITIN® - in-vivo Efficacy
Reduces AHA induced irritation

PENTAVITIN® reduces AHA induced irritation by approximately 22% after 28 days

PENTAVITIN®
Formulation guidelines

- Easy to formulate
- 100% water-soluble
- No preservative
- Processed either warm (< 60°C) or cold
- Compatible with ethanol up to 60%
- Recommended use level for skin care applications: 1 to 5%
- Guide formulations are available upon request
- Formulations are available:
  - 72 hours Deep Hydration Cream for dry skin
  - Deep hydration cleanser for dry skin
**Applications**

<table>
<thead>
<tr>
<th>Face/neck care</th>
<th>Hand care</th>
<th>Body care</th>
<th>Feet care</th>
</tr>
</thead>
<tbody>
<tr>
<td>smoothness</td>
<td>smoothness</td>
<td>smoothness</td>
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</tr>
<tr>
<td>softness</td>
<td>softness</td>
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<td>flakiness</td>
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<tr>
<td>robustness</td>
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<tr>
<td>tightening</td>
<td>tightening</td>
<td>itching</td>
<td></td>
</tr>
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</table>

Can be used for face, neck, foot, hand and body care products for a **comfortable skin feeling** and a **healthy skin appearance**.
Unique product features

1. Unique skin identical carbohydrate complex
2. Unique binding mechanism
3. Outperforms glycerin by nearly 50%
4. ECOCERT approved and NATRUE certified

Benefits

1. Instant, deep hydration
2. Deep hydration for 72 hours
3. Strengthens skin barrier function
4. Stimulates key genes for skin barrier improvement
5. More than 50% improvement in skin smoothness and softness and more than 50% reduction of flakiness and itchiness after only 2 weeks application
Back up

various

BRIGHT SCIENCE. BRIGHTER LIVING.™
**PENTAVITIN®**

72 hours Deep Hydration Cream
for dry skin

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ingredients</th>
<th>INCI Name</th>
<th>% w/w</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>AMPHISOL® K</td>
<td>Potassium Cetyl Phosphate</td>
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<tr>
<td></td>
<td>Cetiol SN</td>
<td>Cetearyl Isononanoate</td>
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<tr>
<td></td>
<td>Crodamol GTEH-LQ-(MV)</td>
<td>Triethylhexanoin</td>
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<tr>
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<td>Carbopol Ultrez 21</td>
<td>Acrylates/C10-30 Alkyl Acrylate Crosspolymer</td>
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<tr>
<td></td>
<td>Lanette 0</td>
<td>Cetearyl Alcohol</td>
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<tr>
<td></td>
<td>Myritol 318</td>
<td>Caprylic/Capric Triglyceride</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td>Lipocire Na 10 Pastilles</td>
<td>Hydrogenated Coco-Glycerides</td>
<td>3.50</td>
</tr>
<tr>
<td>B</td>
<td>Keltrol CG-T</td>
<td>Xanthan Gum</td>
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<tr>
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<td>Preservative</td>
<td>Preservative</td>
<td>q.s.</td>
</tr>
<tr>
<td></td>
<td>Water demin</td>
<td>Aqua</td>
<td>82.10</td>
</tr>
<tr>
<td>C</td>
<td>PENTAVITIN®</td>
<td>Saccharide Isomerate &amp; Aqua &amp; Citric Acid &amp; Sodium Citrate</td>
<td>3.00</td>
</tr>
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</table>
### Deep hydration cleanser for dry skin

<table>
<thead>
<tr>
<th>Phase</th>
<th>Ingredients</th>
<th>INCI Name</th>
<th>% w/w</th>
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<tr>
<td>A</td>
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<td>Cetiol SN</td>
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<td>Lanette O</td>
<td>Cetearyl Alcohol</td>
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<td>Cetiol MM</td>
<td>Myristyl Myristate</td>
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<td>Myritol 318</td>
<td>Caprylic/Capric Triglyceride</td>
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<tr>
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<td>Cetiol SB-45</td>
<td>Butyrospermum Parkii, Shea Butter</td>
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<tr>
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<td>Stearic Acid</td>
<td>Stearic Acid</td>
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<td>Keltrol CG-T</td>
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<td>Saccharide Isomerate &amp; Aqua &amp; Citric Acid &amp; Sodium Citrate</td>
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</tr>
</tbody>
</table>
Hydrated Skin

- Smooth and even surface

Dry Skin

- Flakiness, scaliness
- Rough and uneven surface

Videomicrophotograph
Visible light

SEM micrograph

D Mohammed
University of London
Primary induction of dry skin

- Low environmental temperature and humidity
- Abrupt changes in environmental condition
- Modern indoor, climate-controlled environment
- Surfactant dissolution of SC lipids and NMF loss
- Chronological (intrinsic) aging
- Psychological stress
- Genetics
- Skin pH
Epidermal function is disturbed desquamation in dry skin

Dry Skin

Hydrated Skin

Accumulation of corneocytes as structurally disordered flakes

Corneocytes are released one at a time

Leeson, IJCS 2006
Natural Moisturing factor (NMF):
natural protection shield against dehydration

- **profilaggrin**
  - glutamic acid cyclization
- **filaggrin**
- **PCA** (Pyrrolidone carboxylic acid)
- **UCA** (urocanic acid)
  - histidine / histidase
- **amino acids**
- **sweat**
  - urea (7%)
  - lactate (12%)
  - inorganic salts (19%)
- **gycosylceramides**
- **glycoproteins**
- **proteoglycans**
- **sugars** (8%)
Changes in ceramide content of stratum corneum with increasing skin dryness

![Graph showing changes in ceramide content with increasing skin dryness](image)

*C Harding
IJCS 2000
All products mentioned below do contain PENTAVITIN® !!!!

- Oriflame
  - Soothing Eye Gel
- The Body Shop
  - Camomile Soothing Eye Serum
- Unilever
  - Vaseline After Sun Aloe Vera Gel
  - Dove Sensitive Skin Day Lotion
- Amway
  - Artistry Essentials Replenishing Eye Crème
- DM Balea
  - Alverde Naturkosmetik Anti-Aging Goji Berry Vitamin
- Clinique
  - Self Sun Body Daily Moisturiser
- Estée Lauder
  - Bronze Goddess Golden Perfection Self-Tann
- P&G
  - Dermagram Swiss Herbal Cosmeceuticals Sensitive Solution
- Watsons
  - Cracked heel cream
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