

# Shape-Shifting Technology of High-Molecular-Weight Hyaluronic Acid Realizing Youthful Skin



ID: 176

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## Introduction:

### Consumer needs

**Artificial chemicals** → **Bioactive ingredients**

**Natural HA**

HA

- Low skin permeability
- Short half-life in skin

### Hyaluronan (HA) in skin

Epidermal conditions are influenced by HA.

**Younger** (Dense) vs **Older** (Sparse)

### Issues

**Conventional solutions**

1. Injection: Pain & side effects
2. Microneedles: Limited application area
3. Particulation: Reducing HA's original functions
4. LMW-HA: Reducing HA's original functions

**Aim of this study**

## Materials & Methods:

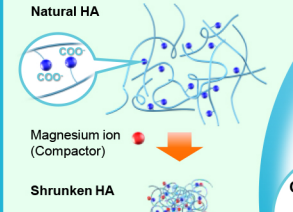
- ### Materials
- Sodium hyaluronate (MW 1100–1800 kDa)
  - Sodium metaphosphate (SMP)
  - Sodium chloride (NaCl)
  - Potassium chloride (KCl)
  - Magnesium chloride hexahydrate (MgCl<sub>2</sub>)
  - Calcium chloride dihydrate (CaCl<sub>2</sub>)
  - Aluminum chloride hexahydrate (AlCl<sub>3</sub>)
- ### Methods
- Skin penetration test (ex vivo)
  - Size measurements of HA by multi-angle light scattering and PSV
  - Elasticity of SC
  - Moisturizing by differential scanning calorimetry and SC water contents
  - Anisotropy of proportion of skin furrows (ALL)

(Abbreviations) HA: Hyaluronan, SC: Stratum corneum, HMW: High-molecular-weight, LMW: Low-molecular-weight, R<sub>g</sub>: Radius of gyration, PSV: Partial specific volume

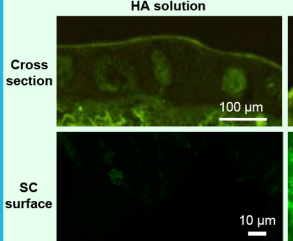
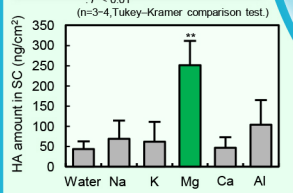
We attempt to develop a novel technology that delivers HMW-HA to the epidermis without diminishing its original function and can be applied to the whole face as a daily cosmetic.

## Results 1

### Compacting Technology



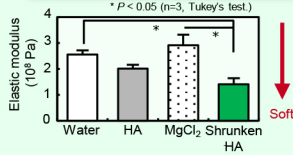
#### 1. HA penetration into epidermis



#### 2. HA size

| Ionic Strength of MgCl <sub>2</sub> | R <sub>g</sub> (nm) |
|-------------------------------------|---------------------|
| 0.01                                | 127.8               |
| 0.05                                | 115.4               |
| 0.10                                | 103.3               |

#### 3. Efficacy of shrunken HA on SC

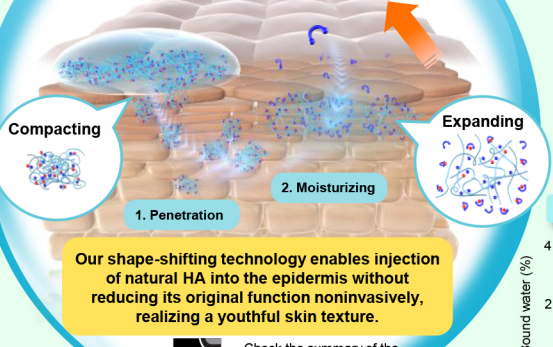


- The size of HA was reduced and its skin penetration into epidermis was drastically enhanced by the addition of MgCl<sub>2</sub>.
- We also investigated the proportion of HA with MgCl<sub>2</sub> (shrunken HA) that penetrates the upper SC via the intercellular route.
- The shrunken HA improved the softness of SC.

## Conclusion

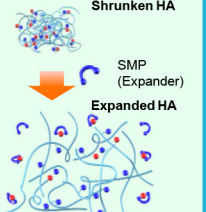
### Ground-Breaking Shape-Shifting HA Technology

#### 3. Realizing youthful skin

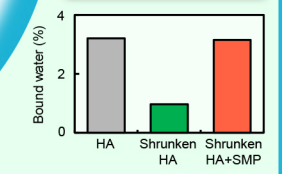


## Results 2

### Expanding Technology

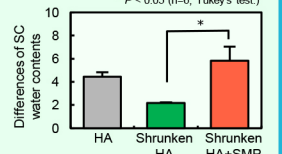


#### 1. Water retention

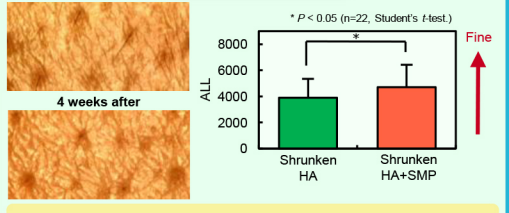


#### 2. HA size

| Condition            | PSV (cm <sup>3</sup> /g) |
|----------------------|--------------------------|
| HA solution          | 0.60                     |
| Shrunken HA          | 0.52                     |
| Shrunken HA with SMP | 0.62                     |



#### 3. Skin texture



- The compacted volume and water retention capacity of shrunken HA were increased by adding SMP.
- The shrunken HA with SMP retained a better ALL value than shrunken HA alone.
- The continuous use of this technology can realize a youthful skin because it leads to a finer and more uniform skin texture by restoring HA's original water retention capacity.