JOYVO A WEIKEM COMPANY fci 中福生物 JOYVO WEIKEM BIOLOGY

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Create a Beautiful & Healthy Life

Joyvo

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- *Sodium Hyaluronate*
- *HA Derivatives*
- *Hydrolyzed Collagen*
- *Pullulan*

About Us

July, 2006

We were born! Joyvo started OEM work on Sodium Hyaluronate and Collagen.

Joyvo started own branding marketing
Sodium Hyaluronate – AquaJuve
Collagen – IvyLanc
Joined WeiKem group

Mar, 2009

Jun, 2012

We had new facility and headquarter in Yangzhou Food Industrial Zone.

Cationic Polymer – NatiFlex
Customized HA – AquaJuve Plus
Pullulan – DuoLux
We started importing and distributing work on aboard cosmetics and nutraceutical ingredients.

2013 – 2014

2015 – 2018

New Facility in Southwest China
New Cationic HA – NatiFlex HyaMate
Keratin – IvyLanc K

New Fermentation Centre
New Facility in East China
J Lab opened

2019 – 2020

The Innovation Continues

Sodium Hyaluronate

ECOCERT COSMOS APPROVED

INCI Name: Sodium Hyaluronate

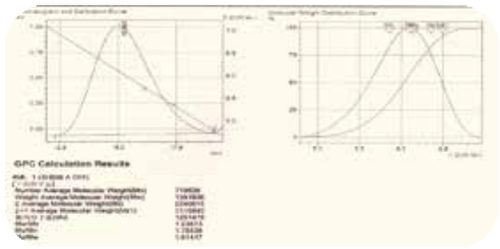
CAS NO. : 9067-32-7

Chemical Name: Sodium Hyaluronate

Sodium hyaluronate is a linear polysaccharide of high molecular weight, naturally occurring in human body. It is applied as a connective tissue organizer and hydrating substance on the basis of its status. The enormous water-binding capacity of sodium hyaluronate is an essential characteristic influencing its biological effects, and as it is a naturally occurring substance, sodium hyaluronate is free of immunogenic activity, and is a non-toxic and non-irritating substance.

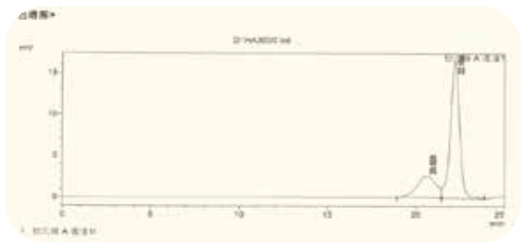
AquaJuve™ Brings You...

Ideal Narrow Molecular Weight



GPC Calculation of AquaJuve CE, Mw/Mn=1.93673

High Purity



Peak Area of AquaJuve 3500 is 197494.

Cosmetic AquaJuve™ Sodium Hyaluronate

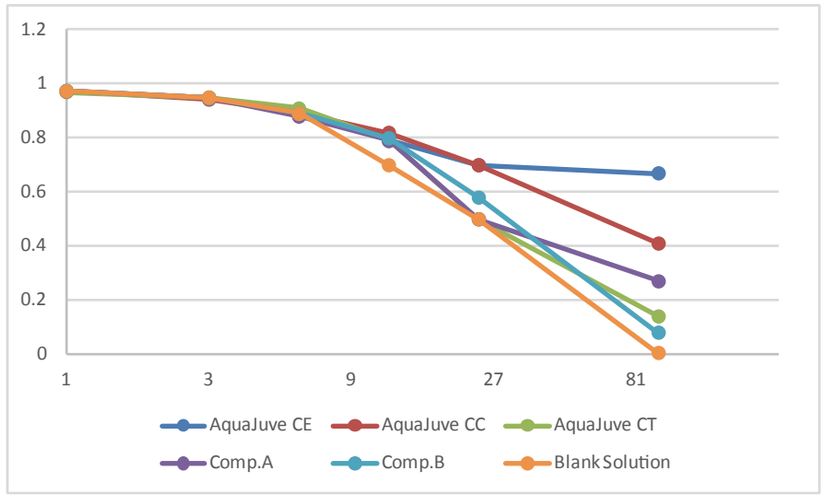
AquaJuve	Molecular Weight
AquaJuve CT	0.8-1.0 MDa
AquaJuve CC	1.0-1.35 MDa
AquaJuve CE	1.2-2.0 MDa
AquaJuve HCE	1.7-2.0 MDa
AquaJuve Q	1% aqueous solution

Origin	Biotechnological processing
Appearance	Off-white to white powder *
Appearance of 1% Aqueous Solution	Clear, colorless solution
Sodium Hyaluronate (dry basis)	90-105%
Glucuronic Acid	≥ 45.0%
Protein	≤ 0.1%
Loss on Drying	≤ 10.0%
Heavy Metal (as Pb)	≤ 20ppm
Arsenic	≤ 2ppm

*: AquaJuve Q appearance is clear, colorless solution.

Excellent Moisture Retention

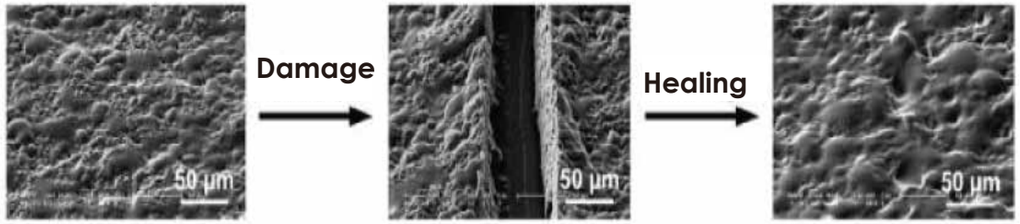
AquaJuve series products have outstanding moisture retention. We make 1% solution of different sodium hyaluronate, then weigh the loss of water after different hours to judge the moisture retention of AquaJuve.



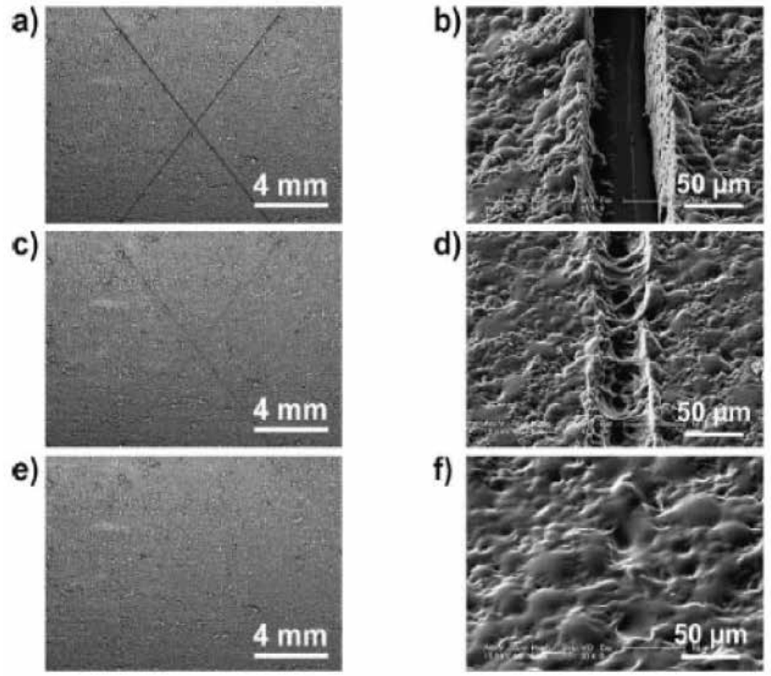
Film Forming and Self Healing

AquaJuve is able to form compact but ventilate film to prevent loss of skin moisture. The film formed by AquaJuve HA is proved to be self healed soon after environmental damage.

Film formed by AquaJuve CT



The details of self-healing process(under 4mm and 50um electronic speculum)



a,b) is 0s after film damaged;

c,d) is 10s after film damaged;

e,f) is 5mins after film damaged.

Nutraceutical AquaJuve™ Hyaluronic Acid

Grade	AquaJuve FD
Appearance	Off-white to white powder
Molecular Weight	0.8-1.2 MDa
Origin	Biotechnological processing
Appearance of 1% Aqueous Solution	Clear, colorless solution
Sodium Hyaluronate (dry basis)	90-105%
Glucuronic Acid	≥ 45.0%
Protein	≤ 0.1%
Loss on Drying	≤ 10.0%
Heavy Metal (as Pb)	≤ 20ppm
Arsenic	≤ 2ppm

SOURCE

- Fermentation, *Streptococcus Zooepidemicus*
- Non-GMO
- Non-animal materials used during the manufacturing process

TOXICOLOGY

- Non-irritating
- Non-cytotoxic
- Non-phototoxic

SOLUBILITY

- Fully soluble in water.
- Insoluble in non-water miscible solvents.

Nutritional Value of AquaJuve™ FD

Unit of Measurement, 1 gram.

Calories	0	**Sodium**	80 mg
Total Fat	0 g	**Potassium**	0 mg
Saturated	0 g	**Total Carbs**	0 g
Polyunsaturated	0 g	**Dietary Fiber**	0 g
Monounsaturated	0 g	**Sugars**	0 g
Trans	0 g	**Protein**	0 g
Cholesterol	0 mg		
Vitamin A	0%	**Calcium**	0%
Vitamin C	0%	**Iron**	0%

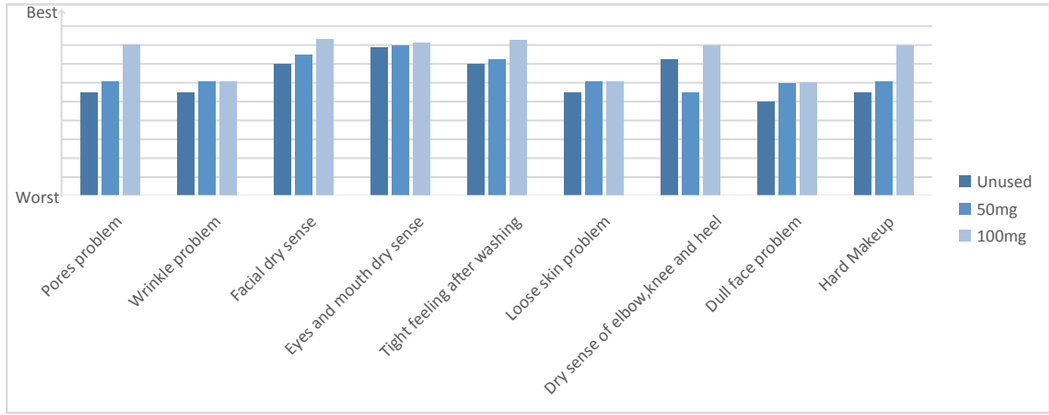
*Percent Daily Values are based on a 2000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

We choose 30 women with age of 25-35 years old randomly, and divided them into 3 groups (10 women per group) in accordance with the average age.
Three groups take placebo (food grade hydroxyethyl cellulose ether), AquaJuve FD 50mg, AquaJuve FD 100mg at 12 o'clock everyday respectively during 28 days. We test the skin moisture improvement through the digital monitor within 3 hours after the last taking.

Before taking

After 4 weeks' taking

Picture 1 Improvements on Skin Texture by intaking AquaJuve FD



The dry skin problems for most subjects, including their faces, mouths and eyes can be improved by oral taken AquaJuve FD. The moisture content and metabolism of skin can be also improved, which lead to improvements of moisture, texture and elasticity.

Innovative forms AquaJuve™ Sodium Hyaluronate

We can produce various forms of sodium hyaluronate and discover all kinds of possibilities, which are able to meet even your most special demands.

Low MW HA

AquaJuve™ 3500
AquaJuve™ Plus

Compound HA

AquaJuve™ ECT
AquaJuve™ Omni

HA Derivatives

AquaJuve™ Ace
NatiFlex™ HyaMate

AquaJuve™ 3500

Generally, sodium hyaluronate has high molecular weight from 0.8-2.0 MDa. This feature leads to excellent film forming and moisture retention properties of HA in cosmetics, nutraceuticals and many other applications.
The innovative form AquaJuve 3500, with only 3,000-10,000 Da. This nano-size HA can be absorbed by skin much easier.
It can be well used in both cosmetic and food fields.

Chemical Properties

Glucuronic Acid: ≥ 45.0%
HA content: 90-105%

Applications

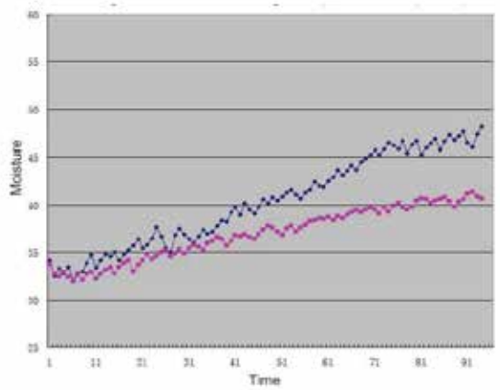
Cosmetics (toner, lotion, etc)
Nutraceuticals

Physical Properties

Off-white Powder
Transparency: ≥ 99.5%

Long lasting Moisturizing

20 Chinese Females with healthy skin conditions are divided into two groups randomly.
Each group involves 10 volunteers.
Age from 28-36. 100% of them finalized the test.
After cleaning face, volunteers apply 0.2% AquaJuve CE and AquaJuve 3500 solution on their cheek and T-zone. Measure moisture content of skin at cheek and T-zone. Record the data and calculate the average value.

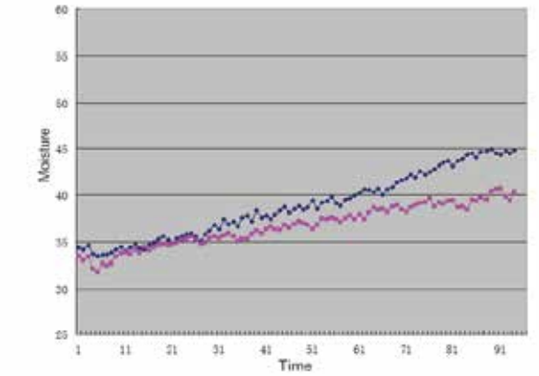


Left diagram. Moisturizing Efficacy Comparison between AquaJuve CE and AquaJuve 3500 in 90 days (Cheek)

Blue for AquaJuve 3500 while Pink for AquaJuve CE

Right diagram. Moisturizing Efficacy Comparison between AquaJuve CE and AquaJuve 3500 in 90 days (T-zone)

Blue for AquaJuve 3500 while Pink for AquaJuve CE



Conclusion

* Skin moisture content can be improved significantly by using AquaJuve CE and AquaJuve 3500.
* AquaJuve CE has better performance on instant moisturizing efficacy.
* AquaJuve 3500 has better performance on long time moisturizing efficacy.
* It is recommended to use AquaJuve CE and AquaJuve 3500 together into formulations to impart both instant and long time moisturizing efficacy.

AquaJuve™ Plus

Chemical Properties

Molecular Weight: 0.01-0.8 MDa

Customized

Glucuronic Acid: ≥ 45.0%

HA content: 90-105%

Applications

Cosmetics (toner, lotion etc)

Nutraceuticals

Physical Properties

Off-white Powder

Transparency: ≥ 99.5%

AquaJuve™ ECT

Chemical Properties

Molecular Weight: 3D Comprehensive

Glucuronic Acid: ≥ 45.0%

HA content: 90-105%

Applications

Cosmetics

(toner, lotion, cream)

Physical Properties

Off-white to white Powder

Transparency: ≥ 99.5%

Tips:

Dissolution Method

HA has excellent compatibility. It can be added into almost all kinds of water-contained cosmetics. The higher the molecular weight, the slower it dissolves. It is recommended to heat while dissolving, and keep a concentration of 0.5~1.0%, heat up the water to 60-80℃ and then put HA slowly with rapid stirring. Pay attention not to make it turn to solid because of its viscosity. Commonly, it takes 20-60 minutes to dissolve completely.

In actual production, we advise customers to take another container and put HA into glycerin, propylene, or1.3 glycol butanediol of partial or full formula dosage. After agitating and immersing sufficiently, transfer it into the water phase tank and heat up slowly to make it dissolve completely.

AquaJuve™ Omni

Chemical Properties

High HA content

Applications

Color Cosmetics

Make Up

Physical Properties

Off-white to light yellow paste

Melting point 65-80℃

AquaJuve Omni is specifically designed for color cosmetic industry. It permits to apply the water soluble-HA in color cosmetic products which are mainly based on oily matrix, and provide excellent moisturizing, lip-plumping, and repairing efficacies. When applied onto the skin, AquaJuve Omni can easily release the inside HA, the small molecule of HA can penetrate into the skin quickly and nourish the skin from inside.

AquaJuve™ Ace

Chemical Properties

Efficial acetyl group

as “Anchor”

Applications

Cosmetics

(toner, lotion, cream)

Physical Properties

Off-white to light yellow powder

AquaJuve Ace is obtained by acetylation of natural moisturizing factor sodium hyaluronate. Acetyl group brings lipophilicity to sodium hyaluronate and enhances the affinity and adsorption of HA to skin.

CATIONIC HYALURONIC ACID

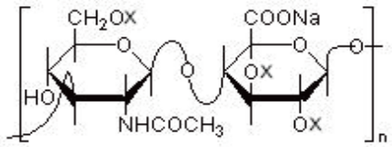
Sodium hyaluronate, is recognized as best moisturizing factor in nature. Ordinary HA is an anionic linear molecular and does not have conditioning efficacy in hair care fields.

NatiFlex HyaMate is an innovative cationic hyaluronic acid. By using HA AquaJuve as backbone, cationic group is combined optimally by Joyvo's own technology. Compared to regular HA, NatiFlex HyaMate has remarkable moisturizing effect on hair, the moisturizing performance is enhanced in skin care as well.

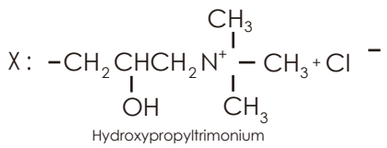
How does Cationic HA work in hair care fields

Surface of the hair is usually charged negative.

NatiFlex HyaMate is charged positive.



AquaJuve™



NatiFlex™ HyaMate

NatiFlex HyaMate is presumed to adhere to hair by ionic bond.

Typical Properties

Items	Specifications
Grade	NatiFlex HyaMate
Appearance	White to light yellowish powder
Identification	
(1) Reaction with CPC	Positive
(2) Sodium	Positive
(3) Glucuronic Acid	Positive

NatiFlex™ HyaMate brings you

- Good synergy efficacy in shampoo and hair conditioner
- Enhance water retention of hair
- Apply in cationic, nonionic and anionic systems
- Reduce irritation
- Adjust liquid viscosity
- Easy to use

Application:

- Hair mist, hair gel.
- Liquid hair treatment
- Shampoo, conditioner
- Hair treatment, shower gel
- Hand cream, eye cream

Dosage Recommendation:

- NatiFlex HyaMate: 0.05-0.20%

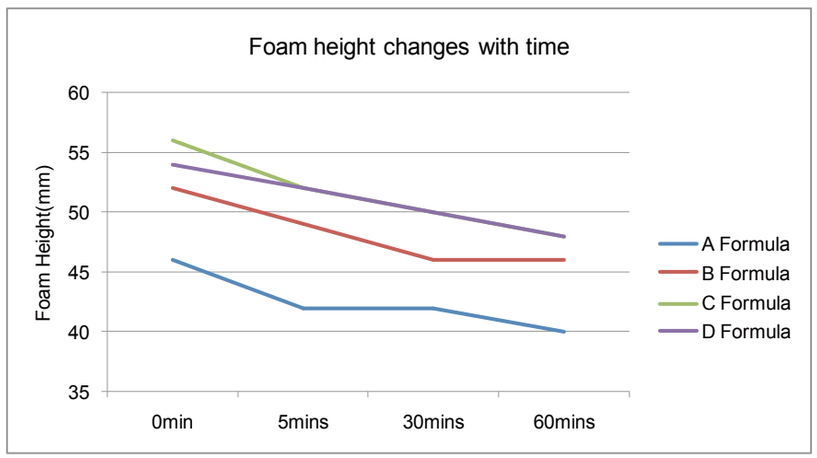
NatiFlex™ HyaMate in shampoo

Test formula	AESA	CAB	CGG	DC200	NatiFlex HyaMate	Pullulan	Water
A	16%	5%	0.2%				To 100%
B	16%	5%	0.2%	0.5%			To 100%
C	16%	5%	0.2%	0.2%	0.1%	1%	To 100%
D	16%	5%	0.2%		0.1%	1%	To 100%

Foaming and Stabilizing Effect

A B C D

As can be seen from the pictures and table, combination of cationic hyaluronic acid and pullulan can greatly increase the amount of foam, and the foam is delicate and stable.



Perfect replacement of silicone

Wet hair, group A has the most fluffy hair, group B is slightly fluffy, and group C and group D have no difference.

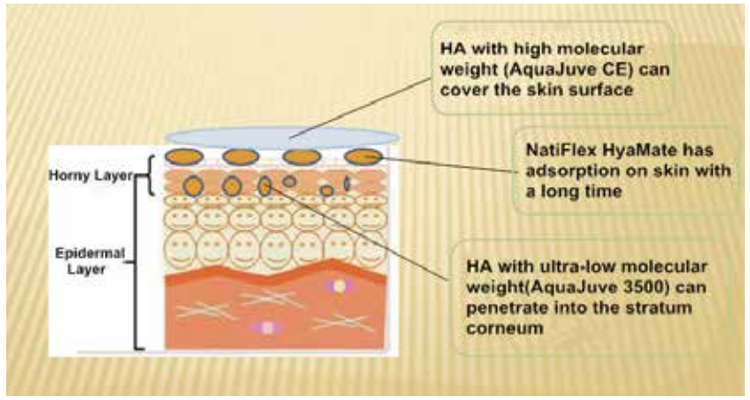
Dry hair, group A is most fluffy, another groups have no significant difference.

Hair bundles are pulled at a speed of 300 mm/min. The displacement is 200 mm, and the average load value between 100 and 200 mm is taken.

Load mean value (integral) (gf)	A	B	C	D
	37.60188	18.46274	16.66371	20.53968

It shows that the addition of silicone or cationic hyaluronic acid has good repairing effect on hair. In addition, the measurement data shows that group C has the best effect, indicating that the combination of cationic hyaluronic acid could help the deposition of silicone. Even if the amount of silicone is reduced from 0.5% to 0.2%, the best conditioning effect can be achieved.

NatiFlex™ HyaMate in Skin Care



Volunteers: 6 Chinese women (aged 21 to 24), the moisture content of their hand skin is almost the same.

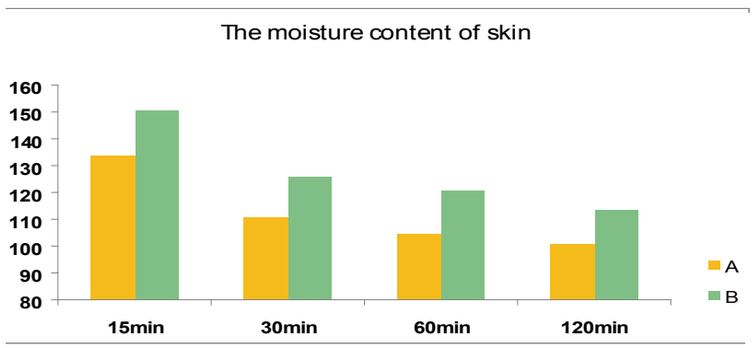
Test method: 6 volunteers join

One hand uses Group A, the other hand uses Group B

Take 0.5 ml from Group A and Group B on each volunteer's hands and smear homogeneously

Wash with water and natural dry

Record the moisture content during different time



Group A: 0.2% common hyaluronic acid

Group B: 0.15% common hyaluronic acid + 0.05% NatiFlex HyaMate

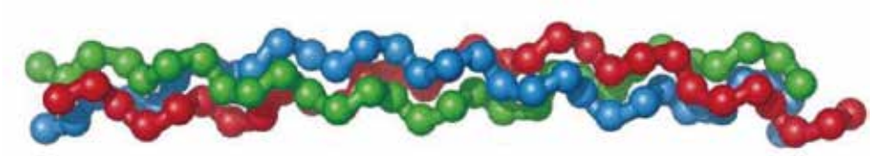
		Trade Name	Moisturizing	Skin Barrier	Smooth	Elasticity	Skin Feeling	Moisturizing	Elasticity	Repair
Skin Care		AquaJuve CT	❄				❄			
		AquaJuve CC	❄	❄			❄			
		AquaJuve CE	❄	❄						
		AquaJuve HCE	❄	❄	❄					
		AquaJuve Q(Liquid)	❄	❄	❄		❄			
		AquaJuve FD	❄					❄	❄	
		AquaJuve ECT	❄	❄	❄					
		AquaJuve Plus	❄				❄		❄	
		AquaJuve 3500	❄						❄	
		AquaJuve Omni	❄	❄						
		AquaJuve Ace	❄	❄	❄				❄	
		NatiFlex HyaMate								
Hair Care								❄		❄
								❄		❄
								❄		❄

HYDROLYZED COLLAGEN

INCI Name: Hydrolyzed Collagen

CAS NO. : 92113-31-0

Collagen is the body's most important building block and makes approximately 30% proteins in our bodies. Collagen is a key structural protein that ensures the cohesion, elasticity and regeneration of all our connective tissues including skin, cartilage and bones. In essence, it is the 'glue' that holds everything together. It strengthens various body structures and the integrity of our skin.

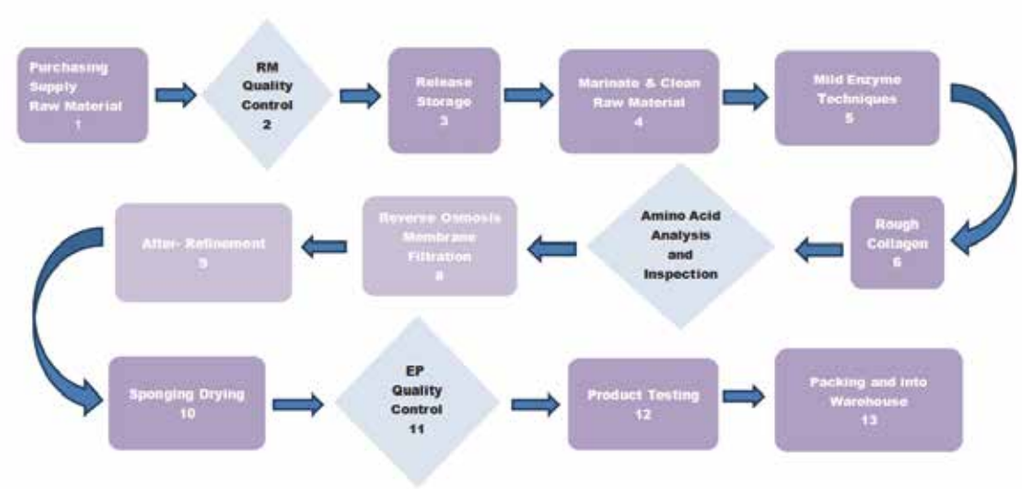


IvyLanc™ Family

IvyLanc	Source	Molecular Weight
IvyLanc F	Fish Skin	2000-3500
IvyLanc S	Fish Scale	1500-2500
IvyLanc 1000	Fish Scale	1000
IvyLanc MF	Marine Fish	2000-3500
IvyLanc IVY-1200	Bovine	2000-4000
IvyLanc II	Chicken Cartilage	N.A.
IvyLanc K*	Chicken Feather	<2000

* Hydrolyzed Keratin, CAS No. 69430-36-0

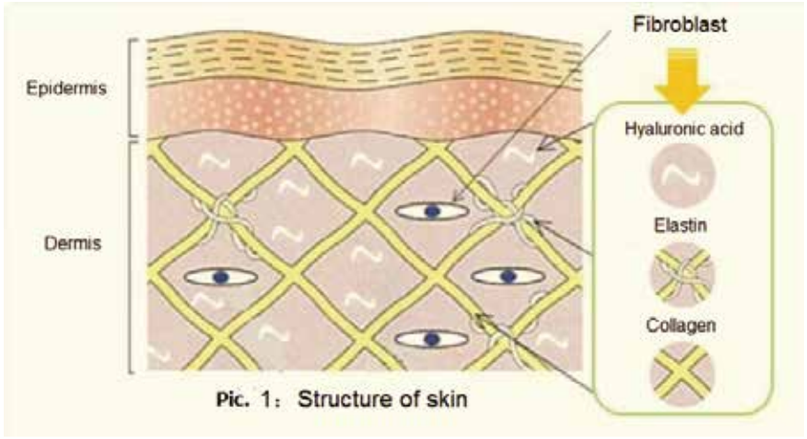
Advanced Production Technology



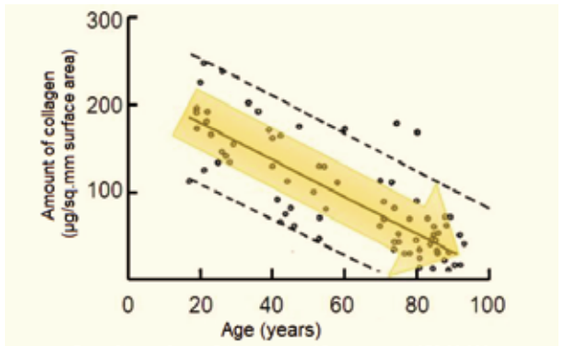
Purchasing Supply Raw Material 1	Raw Material Specifications meet all international requirements regarding cosmetic and food production business.	Marinate & Clean Raw Material 4	Marinate and clean raw material, such as pig skin, bovine skin, chicken cartilage.	Reverse Osmosis Membrane Filtration 8	Like molecular filters, it can remove salt, colloid, bacteria and organic matters dissolved in water.
RM&EP Quality Control 2 & 11	Both Raw Material and Finished Product are released prior use in production/ packaging respectively. Microbiological & physicochemical analytical procedures follow best known standard techniques.	Mild Enzyme Techniques 5	Use mild enzyme techniques, with the high-quality raw material to get rough collagen Use different enzyme formulation according to customer's demand.	After-Refinement 9	Deep processing, control the protein content. For IvyLanc II, also control hyaluronic acid and mucopolysaccharides content.
Release Storage 3	Along with QC, formal release are the pillars of traceability. Raw material depot comply standards of temperature and ventilation to ensure safety operations and proper raw material storage.	Rough Collagen Amino Acid Analysis & Inspection 6 & 7	Regular inspection (Amino Acid and other index) Promptly reconcile key point of productin.	Sponging Drying 10	Get the mesh according to customer's request, 60mesh, 80mesh and so on.
Product Testing 12	The second test, full set test. Including color, odor, main index content, pH, microbiology, material solution, transparency.	Packing and into Warehouse 13	Regular package: 20kg fiber drum. Final product storage and distribution is done in a clean controlled area.		

Cosmetic IvyLanc™ Collagen

Generally, skin is made of epidermis and dermis. Epidermis is an important organ that exposed to environment directly. Dermis lies under epidermis, composed by collagen, elastin, hyaluronic acid etc. Collagen imparts elasticity to skin, and hyaluronic acid it contains is a significant natural moisturizing factor.



Pic. 1: Structure of skin



From: Shuster S. etal, British Journal of Dermatorogy(1975)93,639

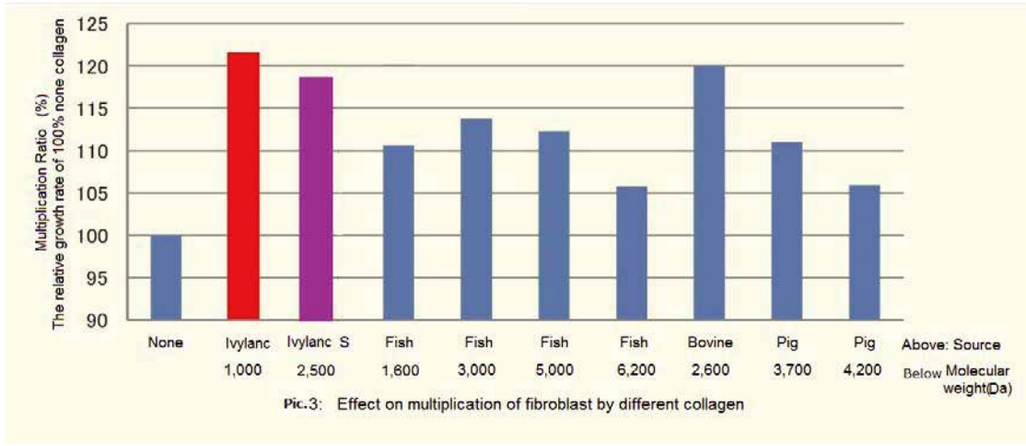
Pic. 2: Collagen amount decreasing by human aging

Mechanism of left chart is the declined metabolism and the decreased collagen synthesis of skin.

The synthetic function of collagen is related to fibroblast in dermis. Fibroblast amount decreases with age. Lifetime of fibroblast is shortened by daily UV irradiation as well.

Therefore, reduction of skin elasticity and moisture are closely related to the decrease of fibroblast amount in dermis.

IvyLanc™ collagen improves multiplication ability of fibroblast significantly

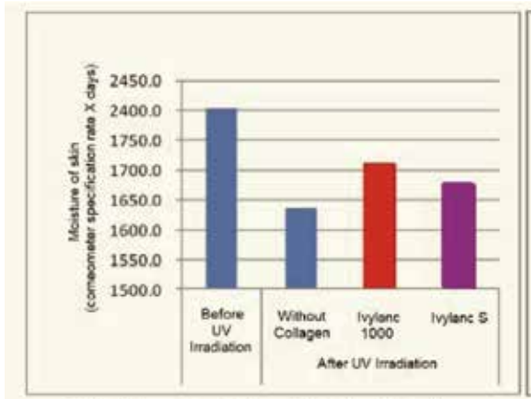


Pic.3: Effect on multiplication of fibroblast by different collagen

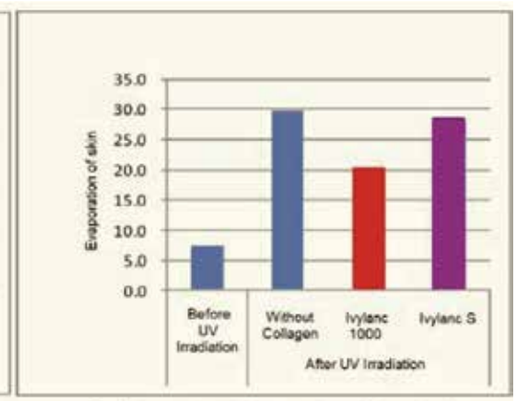
Add 50ug/ml different collagen (Different molecular weight, source and from different suppliers in market) into culture solution of Fibroblast (Natural human dermal fibroblast, NHDF).

We can see all the collagen above are able to improve multiplication ability of fibroblast, and IvyLanc 1000 has the best performance among them.

IvyLanc™ Collagen improves function of UV damaged skin significantly



Pic. 4: Collagen can control the reduction of moisture in skin



Pic. 5: Collagen can control the evaporation of moisture in skin

Feed IvyLanc 1000 and IvyLanc S to the mice with UV damaged skin based on 500mg/kg BW

It shows IvyLanc 1000 imparts best moisturizing efficacy to damaged skin with extraordinary controlling in moisture retention.

Food and Joint Health IvyLanc™ Collagen

Nutrition plays a key role especially when athletes prepare to reach optimum performance level and the essential role of proteins is also well known to recreational athletes and active consumers.

Amino acids (% of protein)	IvyLanc average value
Alanine	7
Arginine	6
Glutamic acid	11
Glycine	24
Hydroxyproline	12
Proline	13

IvyLanc collagen delivers numerous health and nutritional benefits to athletes both during and after exercise.

Type II collagen is composed by three a （II）chains. The fiber diameter in cartilage matrix formed by Type II collagen is very fine, and all these fine fibrils form delicate network structure in cartilage.

*
1. Moskowitz RW. Role of collagen Hydrolysate in Bone and Joint Disease. Seminars in Arthritis and Rheumatism, 30(2): October, 2000: pp 87-99
2. Bello AE, Oesser S. Collagen hydrolysate for the treatment of osteoarthritis and other joint disorders: a review of the literature. Curr Med Res Opin. 2006 Nov;22(11): 2221-32
3.Seeligmuller K, Happel HK. Can a mixture of gelatin and L-cystine stimulate proteoglycan synthesis? Therapiewoche 1989;39: 3153-57.

10 grams of collagen hydrolysate per day has been shown to be an effective dosage in clinical trials
IvyLanc II (type II collagen) is more effective for jiont health because it contains hyaluronic acid natively.

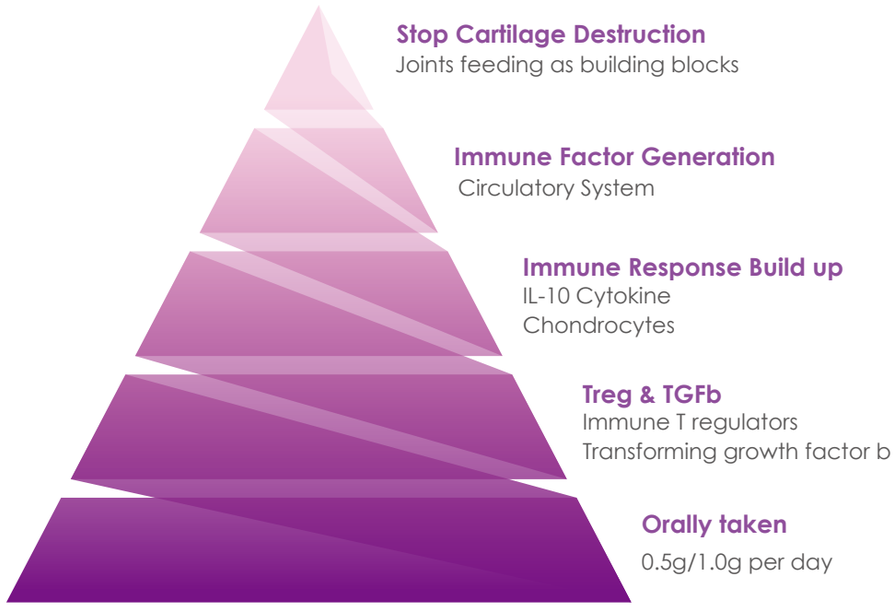
Aiding muscular contraction

Muscle restoration

Provide energy for performance

Weight management

Mechanism of IvyLanc II on Joint Health



Nutritional Value of IvyLanc II Collagen

Calories	295-350 Kcal
Total Fat	≤1.0 g
Mineral Salts	≤8.0 g
Total Carbohydrates	24.0-30.0 g
(Sugars in carbohydrates)	9.0-10.0 g
Protein	≥60.0 g
Fiber	≤0.2 g
Water	≤12.0 g

Unit of Measurement, 100 gram

IvyLanc™ in Hair Care

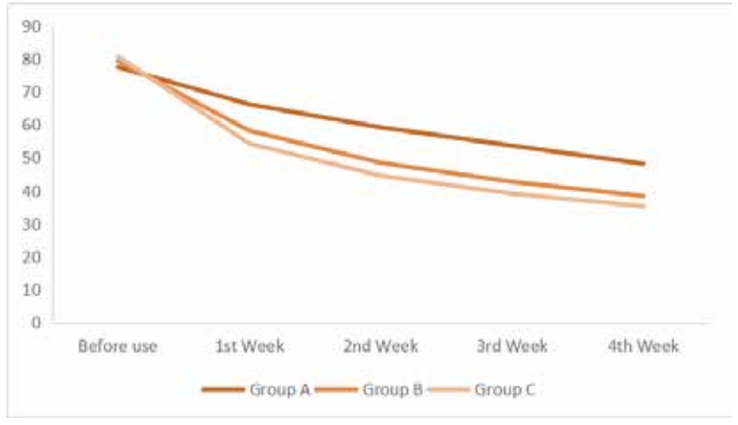
IvyLanc S provides subcutaneous tissue scalp with enough nutrition, which is the main reason to maintain healthy hair. Located in dermis, collagen is the source of nutritional supplementation, providing nutrition for epidermal layer and epidermal appendage. As hair protective layer, hair cuticle is a very fragile tissue and could be damaged when it gets rubbed or heated. IvyLanc K is a hydrolyzed keratin made from natural feathers by enzymatic technology. It has high affinity to hair and can be absorbed by hair to repair hair damage.

12 Chinese female volunteers (24 to 43 years old), all volunteers' hair are same quality.
Divide 12 volunteers into 3 groups.
Group A use blank shampoo, group B use shampoo with 1.0% IvyLanc S, group C use shampoo with 0.5% IvyLanc S + 0.5% IvyLanc K.
Test for each group lasts for 4 weeks, measure 3 times per week (every Tuesday, Thursday and Saturday)
Test the hair data in Joyvo Lab every Sunday morning.

Average Data Record of Split Hair from Three Groups

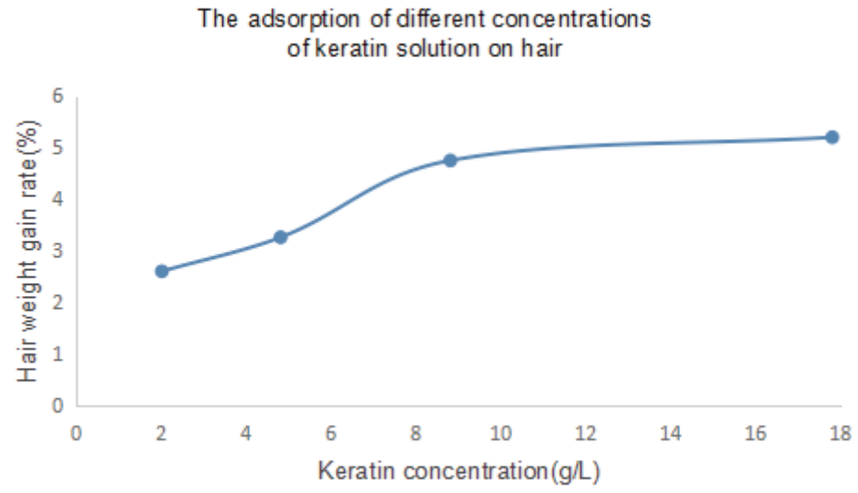
Volunteers	Before Use (pcs)	1st Week (pcs)	2nd Week (pcs)	3rd Week (pcs)	4th Week (pcs)
Group A	77.5	66.2	59.2	53.7	48. 2
Group B	79.4	58.2	48.5	42.7	38.4
Group C	80.7	54.3	44.6	39.1	35.3

Split Hair Average Data Comparison



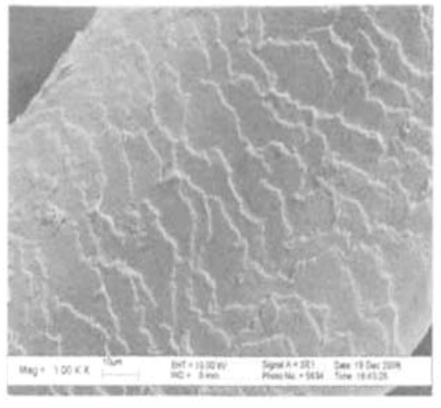
Compared with using IvyLanc S alone, compound IvyLanc S and IvyLanc K have better synergistic effect and more obvious repair effect on split hair.

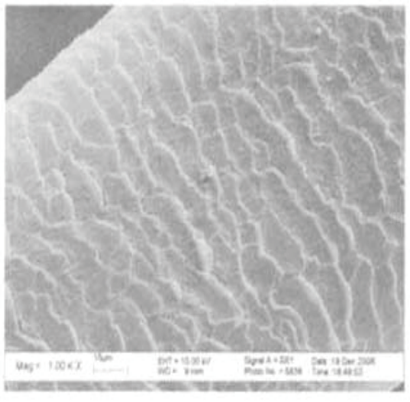
Adsorption of IvyLanc K to hair



Amino and carboxyl groups of keratin can bind carboxyl and amino groups of hair, besides, keratin contains a large amount of mercapto that can form a disulfide bond and quaternary amine bond with the hair, increase the adhesion of keratin on the hair.

SEM after IvyLanc K Treated





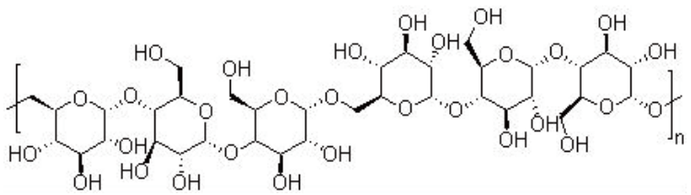
The picture below shows the electrons of the hair in different states. When hair is damaged, the inner cortex exposed, hair becomes rough, poor gloss. After treating by keratin solution, the keratin can form a transparent film on the damaged hair surface and fill the scalded and broken scales so that the scales are smooth and shiny.

Pullulan

INCI Name: Pullulan

CAS NO. : 9057-02-7

Chemical Name: Pullulan



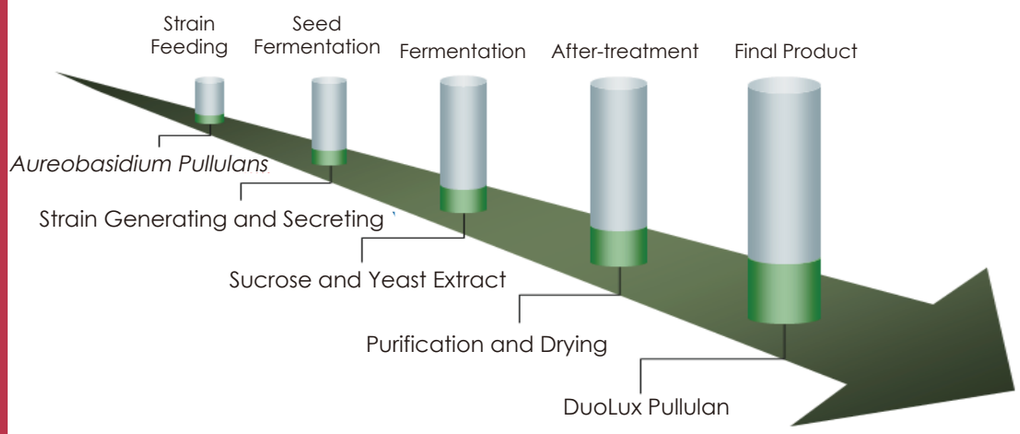
Pullulan is made from *Aureobasidium Pullulans* by fermentation, it has various applications in cosmetics and food industry. It is recommended to be used in skin care, skin cleaning, diet control and food mouthfeel improvement.

DuoLux™ Technical Data

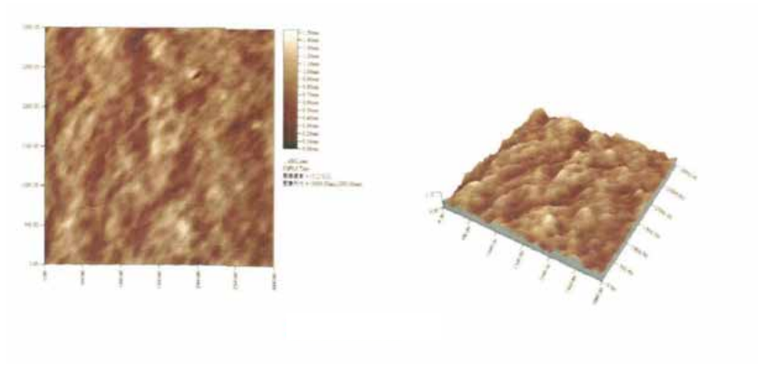
Item	DuoLux™ CM	DuoLux™ FD
Appearance	White or slight yellowish	White or slight yellowish
Pullulan (Dry basis)	≥90%	≥90%
Viscosity (10 wt%,in 30°C, cst)	15-180	15-180
Mono-, Di- and Oligosaccharides	≤10.0%	≤10.0%
Total Nitrogen	≤0.05%	≤0.05%
pH (10% aqueous solution)	5.0-7.0	5.0-7.0
Loss on drying	≤6.0%	≤6.0%
Ash	≤5.0%	≤5.0%

Cosmetic Grade Pullulan- DuoLux™ CM

Production Process



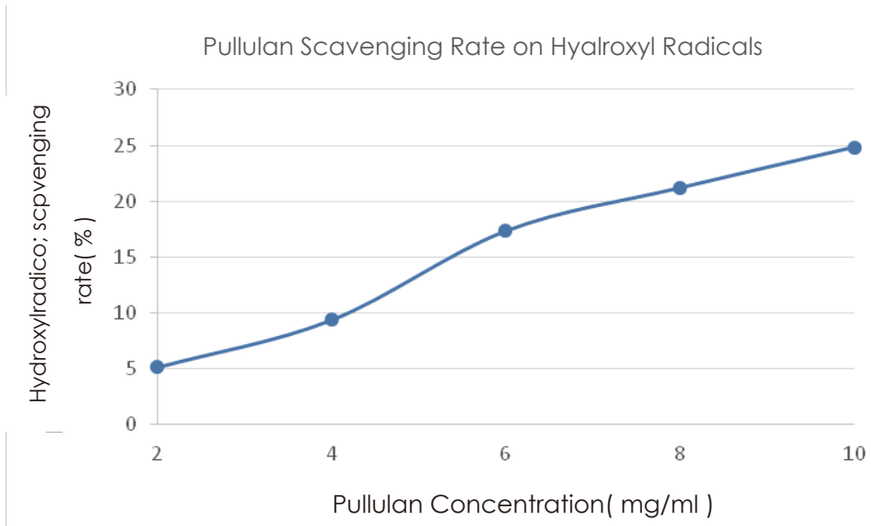
DuoLux™ CM - Excellent Film Forming Property



Pullulan DuoLux CM has regular and compact nano peaks appearance, no obvious pores can be found. The average roughness is low to 0.146 nm which shows that its film surface is smooth.

DuoLux™ CM - Antioxidant Capacity

Hydroxyl radical (-OH) is a kind of reactive oxygen, with strong oxidizing ability. Test the ability of pullulan on scavenging hydroxyl radicals to determine its antioxidant capacity.



Pullulan DuoLux CM, its scavenging ability of hydroxyl radicals increases with concentration increased. It provides proof for pullulan's application in food and cosmetics as an antioxidant agent.

DuoLux™ CM - Efficacy Validation

Number of Volunteers: 45 Chinese women with facial symptoms like excess oil on face, large pores, blackhead, wrinkles, spots, dark skin.

Age range: 25-35 years old

Sample: Vitamin C masks with 2% pullulan,

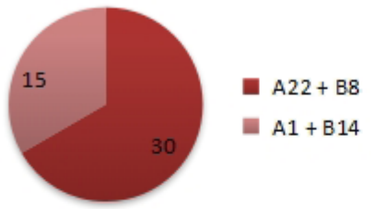
Ordinary Vitamin masks (without pullulan)

Test duration: 20 days. July 02-21, 2014

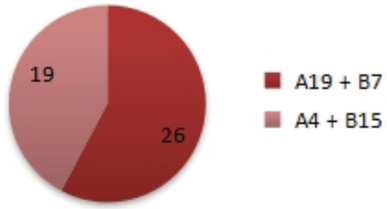
Total 45 volunteers finished the whole test.

Test method: Divide volunteers into two groups, A group (23 out of 23 finished) use Vitamin C masks with pullulan, B group (22 out of 22 finished) use ordinary Vitamin masks.

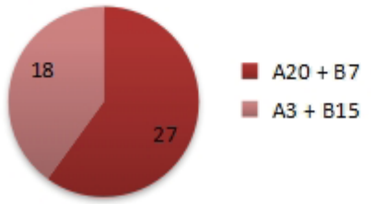
Instant Wrinkles Reduction



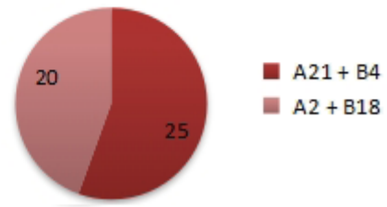
Pores Refining



Whitening



Skin Tendering



From the above charts, A group gets obvious skin improvements. We conclude pullulan has positive efficacy on skin texture and facial texture of volunteers.

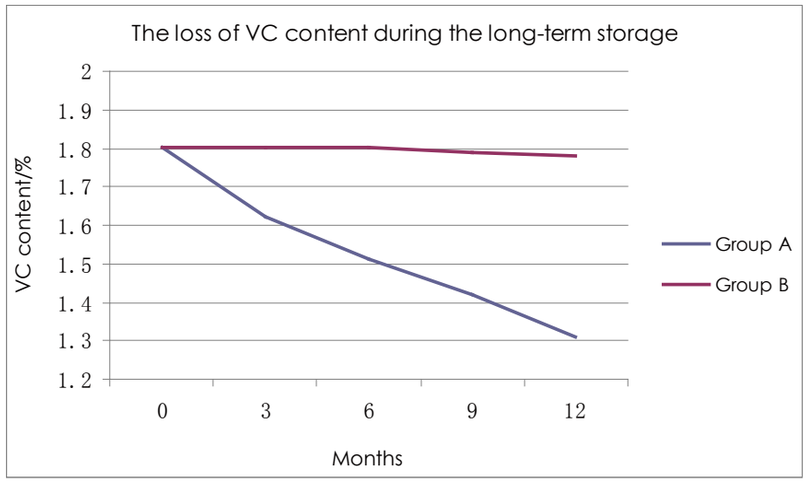
Food Grade Pullulan- DuoLux™ FD

Because of its excellent film forming ability, high safety and good water solubility, DuoLux FD can be applied in food as a coating agent as well as a preservative agent.

DuoLux™ FD – Preservative Agent

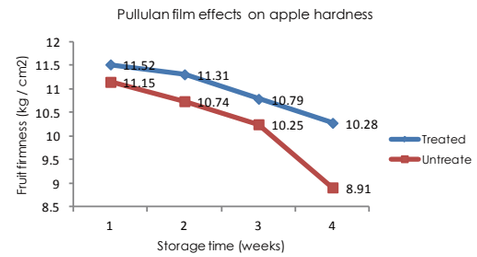
Based on its excellent film forming ability, 1% pullulan solution can be dried to give a clear, odorless, flexible, stable, high strength film, and the film has a super gas barrier property and oil resistance, therefore pullulan plays an important role in food preservation.

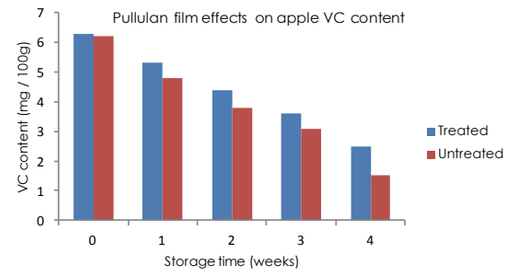
Apply in VC Candy



Store the candy with pullulan added as a gel forming agent for 12 months and the index is no change, while candy without pullulan continue to lose VC during storage.

Apply on Apple



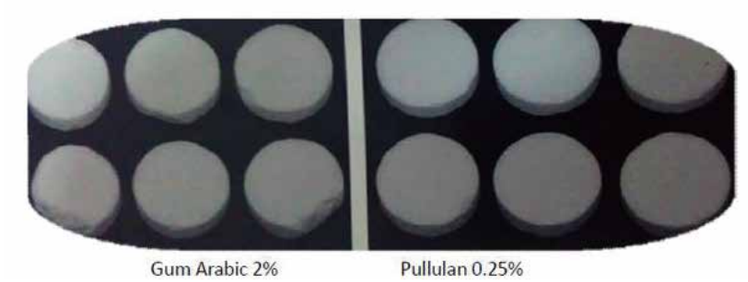


According to the above charts, its preservation effect on fresh fruit is obvious. Besides, it is friendly to environment with no pollution.

DuoLux™ FD – Coating Agent

Pullulan's excellent film formation leads to excellent adhesion as well, not only makes the finished product more complete with polished appearance, but also improves the mechanical strength of finished product.

Apply in Tablet



As a coating agent, pullulan provides effectiveness on protecting tablet completeness.