



Green PDRN

Be Greener, Be Younger

Background

Hot keyword in K-beauty; Skin booster

Types of Injection in KOREA

Botulinum Toxin

Filler

Poly-lactic acid

Exosome

Polydeoxyribonucleotide
(PDRN)

Polynucleotide (PN)



Skin Booster
Market Growth
will accelerate
at a CAGR
(2022-2030)

10.5%

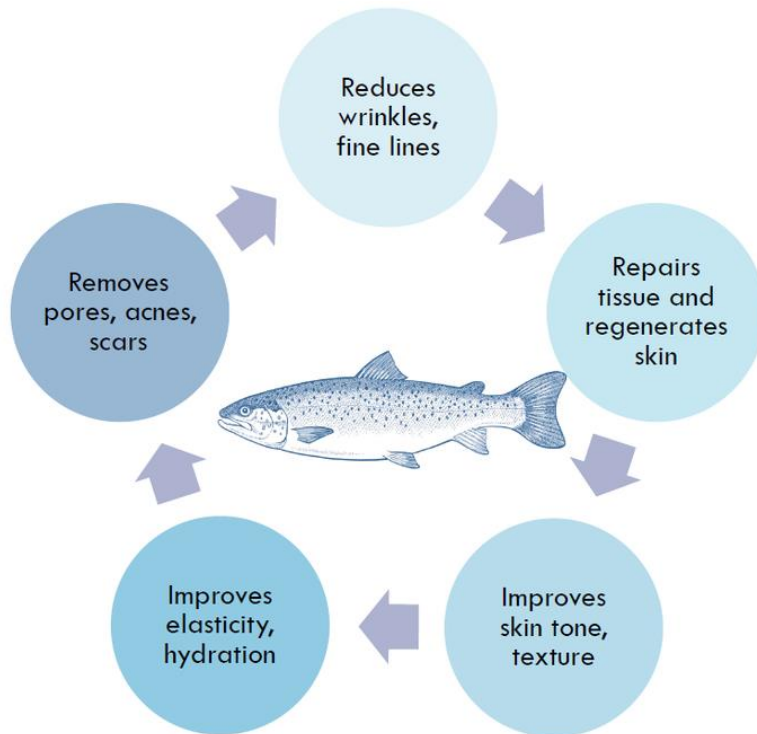


North America
held the
Largest
Skin Booster
Market
Share of
>40%

Background

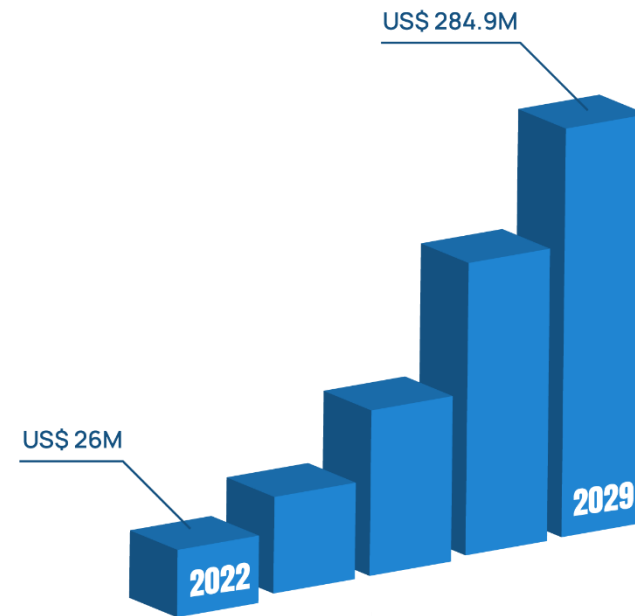
Hot keyword in K-beauty; PDRN

Polydeoxyribonucleotide (PDRN)



Cosmetic Grade Polydeoxyribonucleotide (PDRN) Market

Segment by Type - Powder, Solution



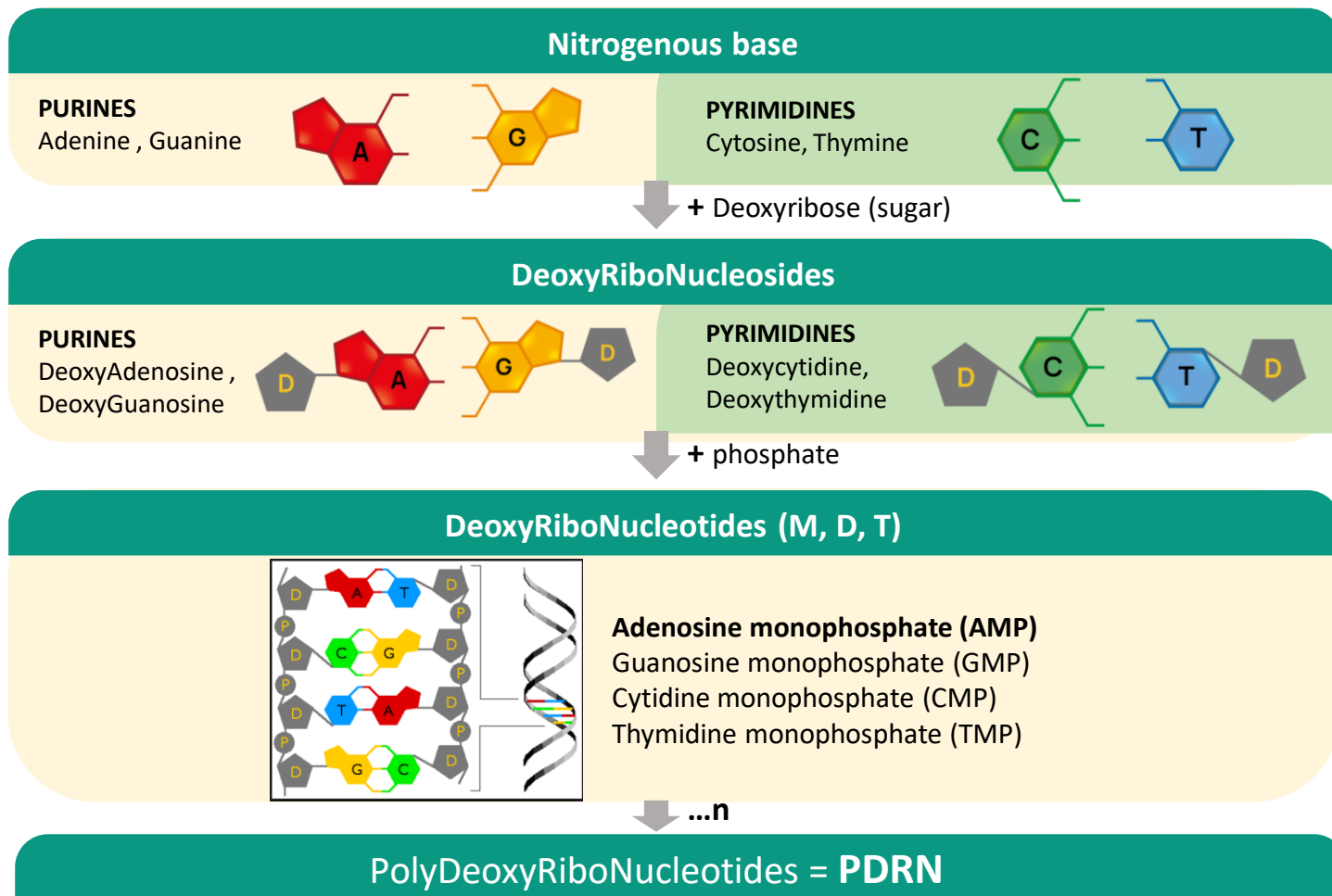
M = millions and B = billions

Valuates Reports®

PDRN : Mechanism of action

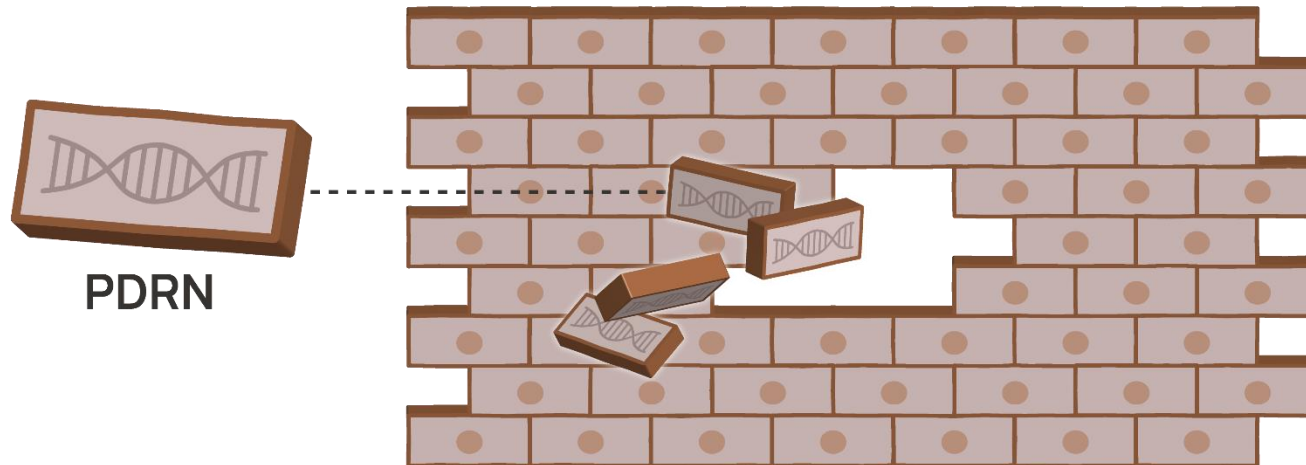
What is **P**olyDeoxyRiboNucleotides (PDRN)?

Reference : Domenica, A; Alessandra, B; Polydeoxyribonucleotide (PDRN) :
A safe approach to induce therapeutic angiogenesis., Cardiovascular &
Hematological Agents in Medicinal Chemistry, 2009, Vol. 7, no.4 315



PDRN : Mechanism of action

Directly provide building blocks to your DNA

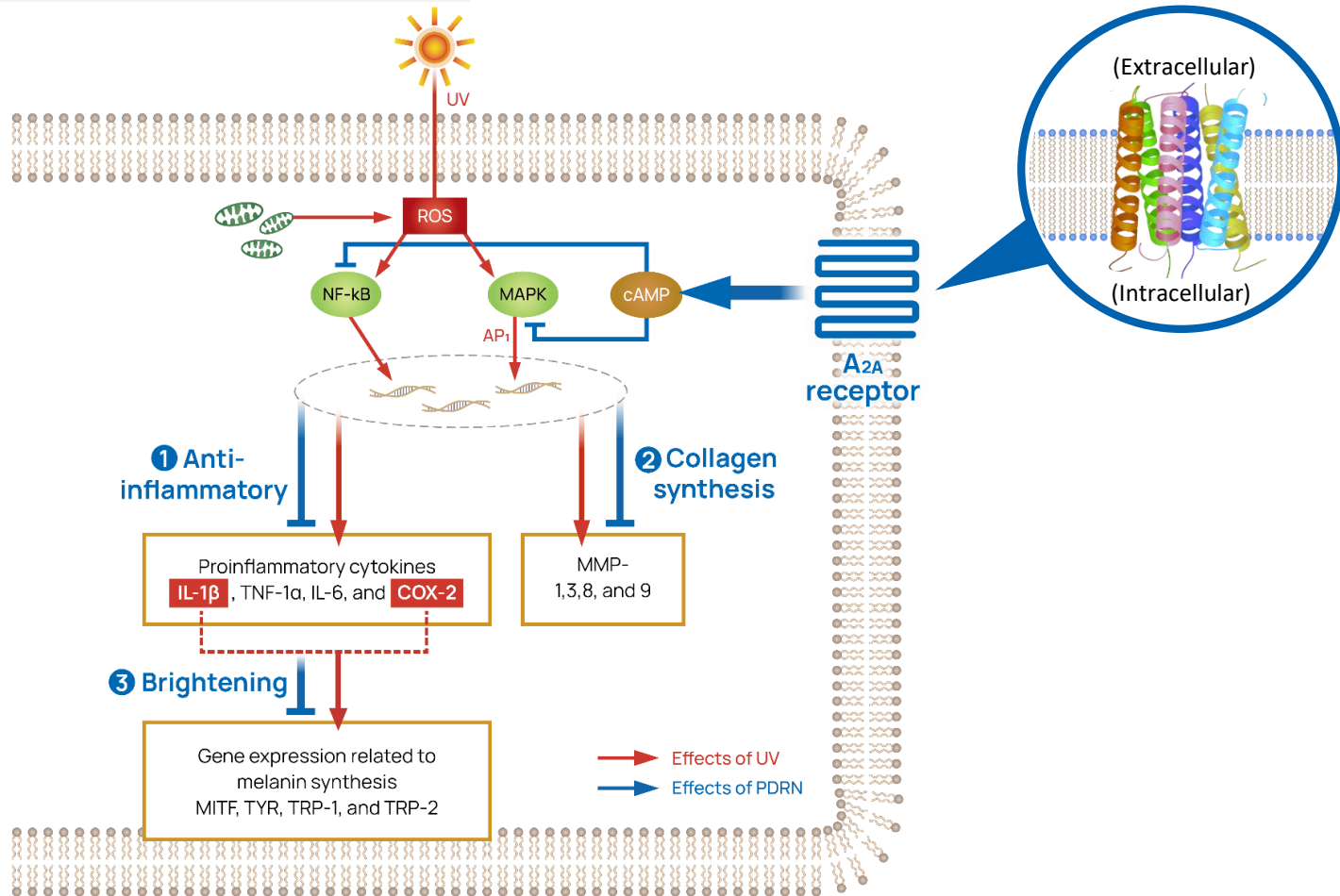


PDRN (PolyDeoxyRiboNucleotide) helps,

- ① Provide Purines and Pyrimidine rings for the 'Salvage pathway'
- ② Generating nucleotides and nucleosides to contribute to DNA formation
- ③ Cell proliferation, leading to a faster tissue regeneration and wound healing

PDRN : Mechanism of action

Role as adenosine A_{2A} receptor activator



Natural safe substance for multiple skin-beneficial effect

①



Chinese Journal of Plastic and
Reconstructive Surgery

Volume 4, Issue 4, December 2022, Pages 187-193



Review Article

Polydeoxyribonucleotide: A promising skin anti-aging agent

Aawrish Khan, Guobao Wang, Feng Zhou, Lunli Gong, Jun Zhang, Lili Qi,
Haiyan Cui

②

Polydeoxyribonucleotide improves wound healing of fractional laser resurfacing in rat model

Mi Yu¹, Jun Young Lee²

Affiliations + expand

PMID: 27762652 DOI: [10.1080/14764172.2016.1247966](https://doi.org/10.1080/14764172.2016.1247966)

③

A Mixture of Topical Forms of Polydeoxyribonucleotide, Vitamin C, and Niacinamide Attenuated Skin Pigmentation and Increased Skin Elasticity by Modulating Nuclear Factor Erythroid 2-like 2

Hyoung Moon Kim,^{1,†} Kyung-A Byun,^{1,2,†} Seyeon Oh,² Jin Young Yang,² Hyun Jun Park,³ Moon Suk Chung,⁴ Kuk Hui Son,^{5,*} and Kyunghee Byun^{1,2,*}

④

Analysis of Skin Regeneration and Barrier-Improvement Efficacy of Polydeoxyribonucleotide Isolated from Panax Ginseng (C.A. Mey.) Adventitious Root

by Kwang-Soo Lee¹, Soyeon Lee¹, Hyesoo Wang¹, Geonhee Lee², Seolyeong Kim²,
Yang-Hwan Ryu^{1,3}, Nicole Hyesoo Chang⁴ and Yong-Won Kang^{1,*}

Reference 1 : Aawrish K., Guobao.W, Polydeoxyribonucleotide : A promising skin anti-aging agent, Reconstructive Surgery Vol.4, Issue 4, December 2022, pages 187-193

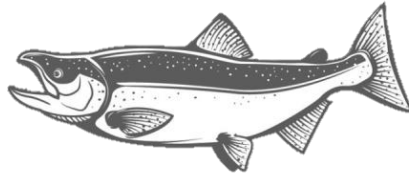
Reference 2 : Mi Y., Jun Young.L, Polydeoxyribonucleotide improves wound healing of fractional laser., J. Cosmet Laser Ther. 2017 Feb;19(1):43-48.

Reference 3 : Hyoung Moon K., Kyung-A.B., a Mixture of Topical Forms of Polydeoxyribonucleotide., Molecules. 2022 Feb; 27(4): 1276.

Reference 4 : Kwang soo L., Soyeon L., Analysis of Skin Regeneration and Barrier-improvement Efficacy of Polydeoxyribonucleotide., Molecules 2023, 28(21), 7240.

Beyond original

PDRN Salmon



Origin : Salmon's semen or testis

Process : Raises fishes-> Extracts semen or testis from salmons

BUT !

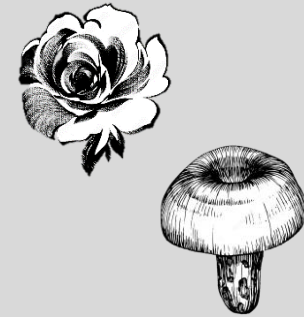


Derived from living organism



No available vegan claim

GREEN PDRN



Origin : Plants

Process : Typical method for each type of raw material

SO !



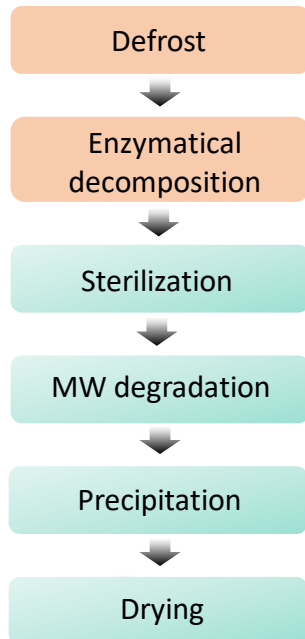
Vegan/Cruelty free



Customization available

Beyond original

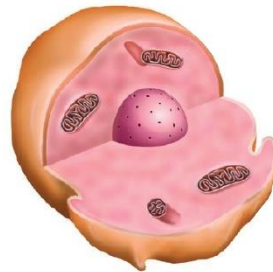
Flow chart Salmon PDRN



Preconditioning
Process



Manufacturing
Process

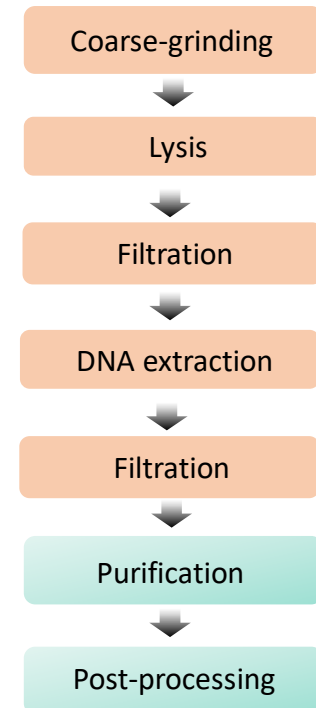


Animal cell
Yield : ~7%



Plant cell
Yield : ~0.003%

Flow chart Green PDRN



⇒ **Higher Tech. & Research is required to get Green PDRN in terms of time, expense, and yield**

DNA extraction protocol

Limitation of Current extraction method

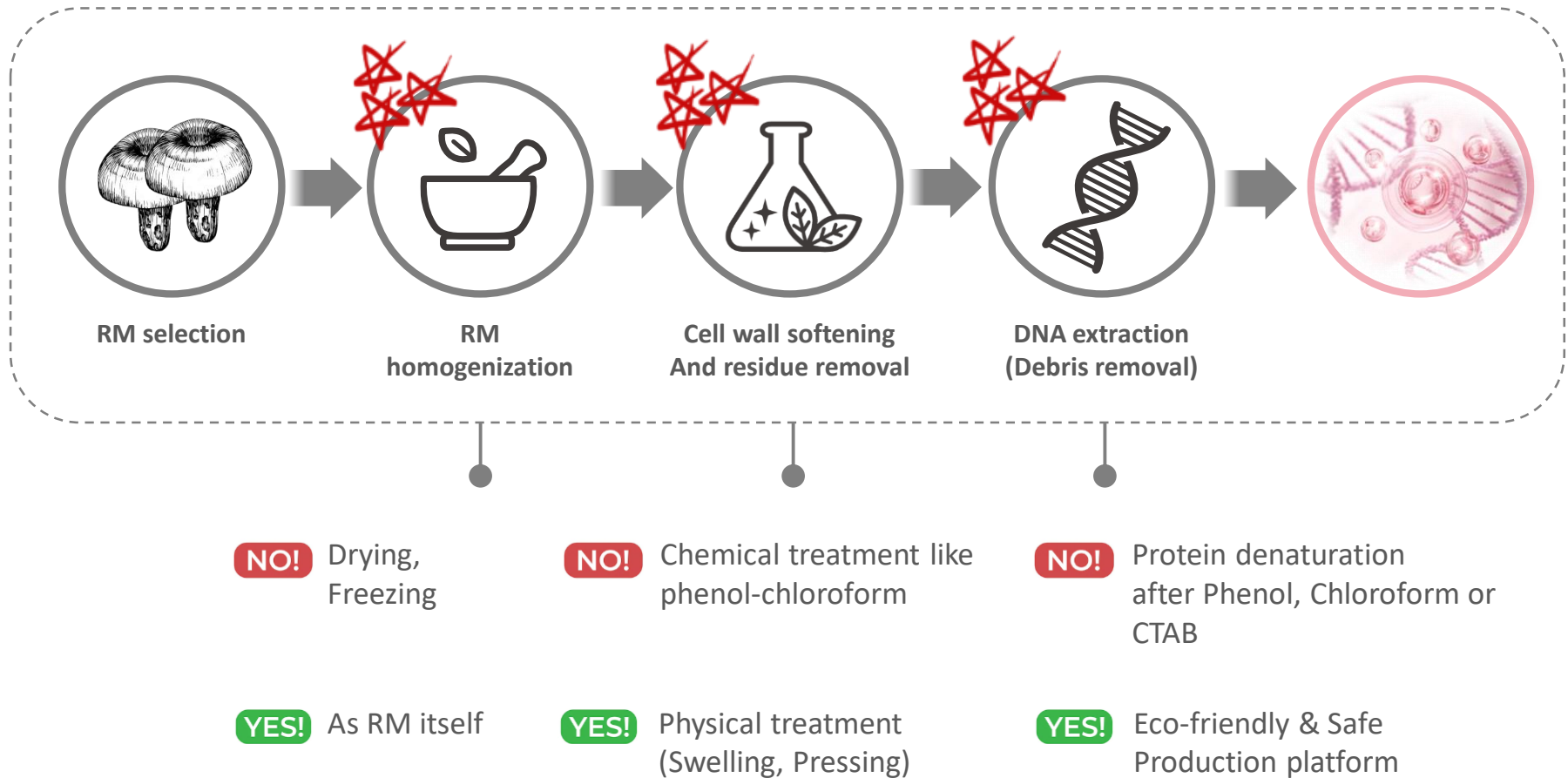
- Carelessness pre-preparation process
- Frequent usage of phenol-chloroform
- Uncertain precipitation method to get DNA



IMPORTANT

- Specific Pre-preparation process for each plants
 - Green extraction method without hazardous solvent
 - Elimination of Histone protein, Phospholipid, Cell wall, Nuclear membrane
- => Understand each plants' structure, Design the best extraction method**

Green process for Green PDRN



In-vitro (Example)

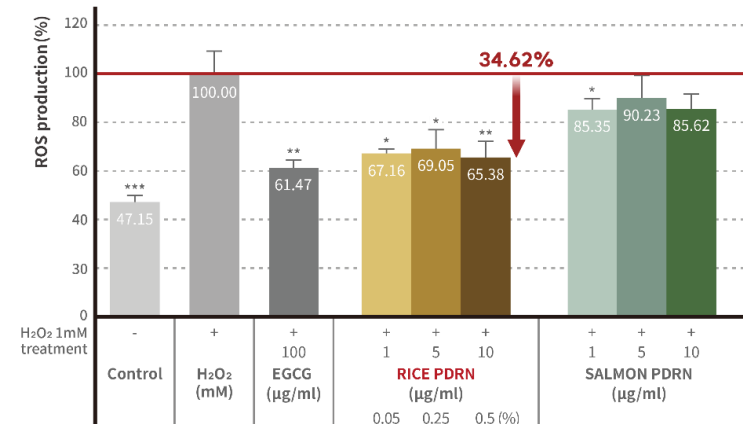
All the efficacy tests are designed based on typical characteristics of plants



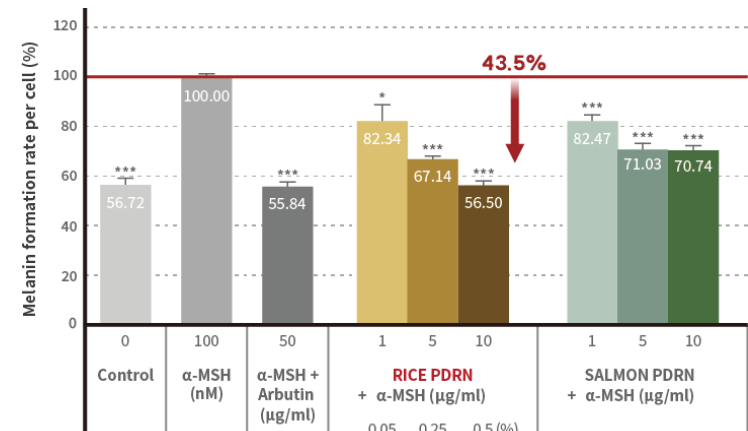
Rice bran

Rice bran, which is known for its beneficial constituents such as phenolic compounds, betaine, and squalene, has demonstrated anti-aging, Anti-inflammatory, whitening benefits.

Anti-oxidant
(ROS production)



Skin brightening
(Melanin formation)



In-vitro (Example)

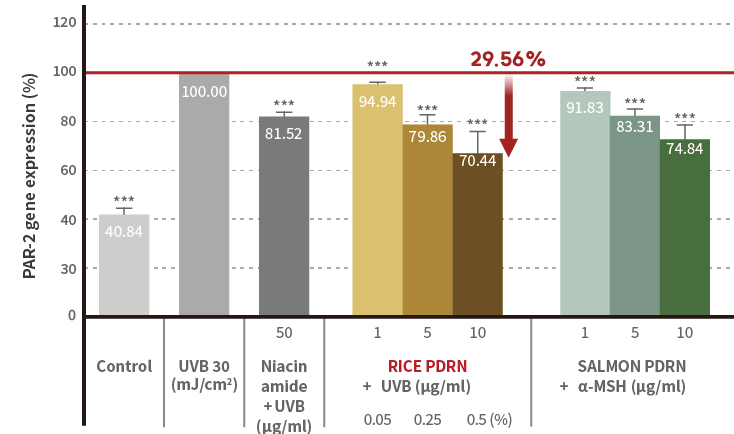
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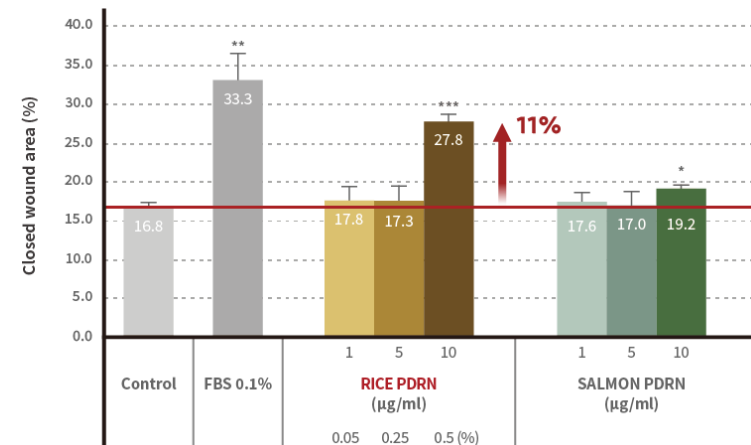
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Skin brightening
(PAR-2 mRNA)



Wound healing
(Scratch assay)



In-vitro (Example)

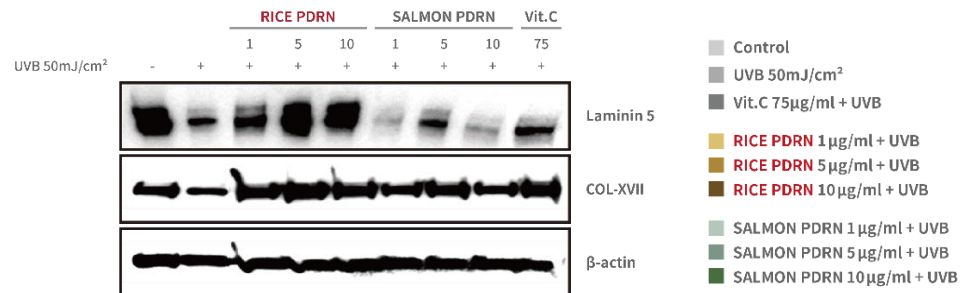
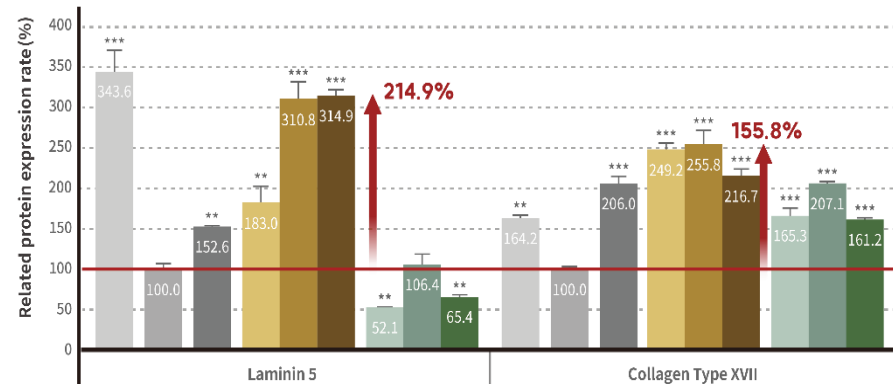
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DEJ Strengthening (Laminin5, Collagen type XVII)



In-vitro (Example)

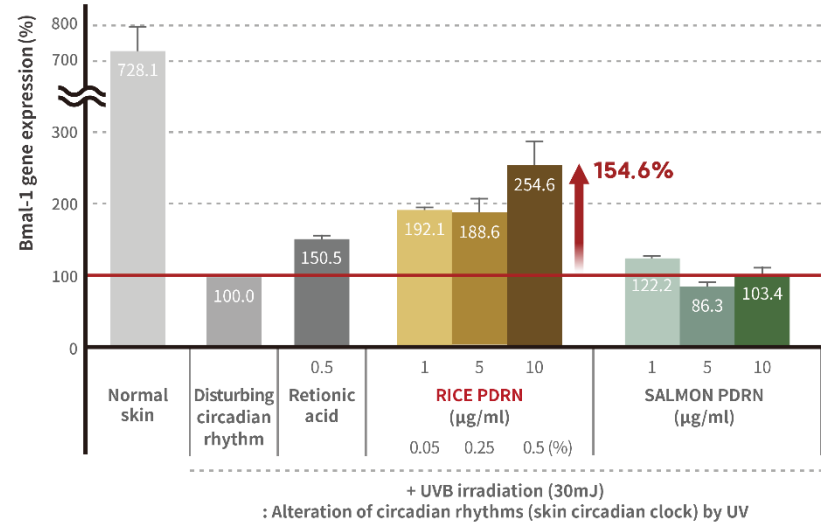
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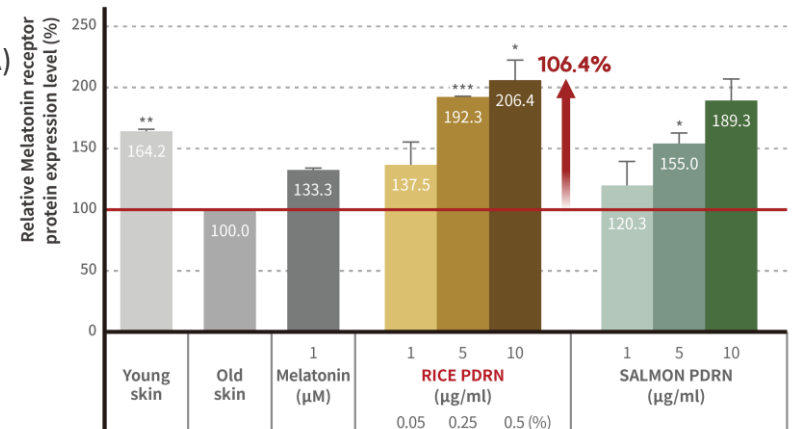
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Circadian Rhythm (Bmal-1 gene)



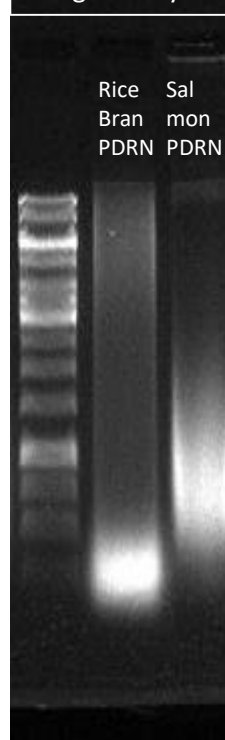
Circadian Rhythm (Melatonin Receptor 1A)



Specification (Example)

	RICE PDRN
INCI Name	WATER (and) 1,2-HEXANEDIOL (and) SODIUM DNA (and) SODIUM PYTATE
Description	Yellow liquid
Odour	Typical
pH (neat)	6.0 ~ 8.0
Refractive Index	1.330 ~ 1.360
DNA Contents	> 2,000 mg/kg
Heavy Metals	Not more than 20ppm
Arsenic	Not more than 2ppm
Microbiological purity - Total bacterial count - Yeast & molds	Not more than 100cfu/mL Not more than 10cfu/mL

Molecular weight analysis



Summary

Application of hot K-beauty into cosmetics

We will open the new era for 'Non-Invasive treatment of PDRN'

INFORMATION

INCI : Water, Sodium DNA, Sodium Pytate

Preservative : 1,2-Hexanediol

Origin : Plant

Recommended dosage : 0.5 ~ 1.5%

GREEN PDRN is a plant derived hydrolyzed DNA, a chance to provide non-invasive treatment of PDRN. Not only the origin is special but also Hyundai Bioland's green process of extraction will make your formula greener, and healthier.

POINT

- Plant derived hydrolyzed DNA
- Apply very start of your brand heritage in your formula
- Recover the damaged skin with DNA building material



VEGAN



SPECIAL



EFFECTIVE



Thank you