

Jellyfish Collagen Next-Gen Biomaterials Platform

Embedding Ocean Conservation Directly into Sustainable Biotechnology

HAEPAGEN | AA&T Co., Ltd.

HAEPA
GEN **JELLYFISH**
COLLAGEN

ESG-Driven Bio Innovation

Converting Threat to Value

Haepagen embeds the absolute value of marine conservation directly into technology. We convert the global ecological threat of overpopulating jellyfish into high-margin biotech solutions.

By upcycling nuisance jellyfish into high-purity premium collagen, we restore marine life while establishing a highly scalable, multi-sector platform.



We are an ESG innovation company embedding the value of ocean conservation into our technology

*"Haepagen is not just a collagen-producing business.
We are an ESG-centric pioneer that restores oceans
and builds entirely new biotech markets."*

— Ki Dong-ho, CEO of Haepagen & AA&T

Innovative Start-up Start-up

HEPAGEN is an innovative marine biotechnology company with high growth potential, driven by advanced technologies.



Business Planning

- Market research
- Industry analysis
- Business model design
- Goal setting



R&D and Product Development

- Research & Development
- Prototype development
- Safety and efficacy validation
- Intellectual property (patent) securing



Production Infrastructure

- Build GMP-compliant facility
- Obtain regulatory approvals
- Establish quality control system
- Secure investments



Operations

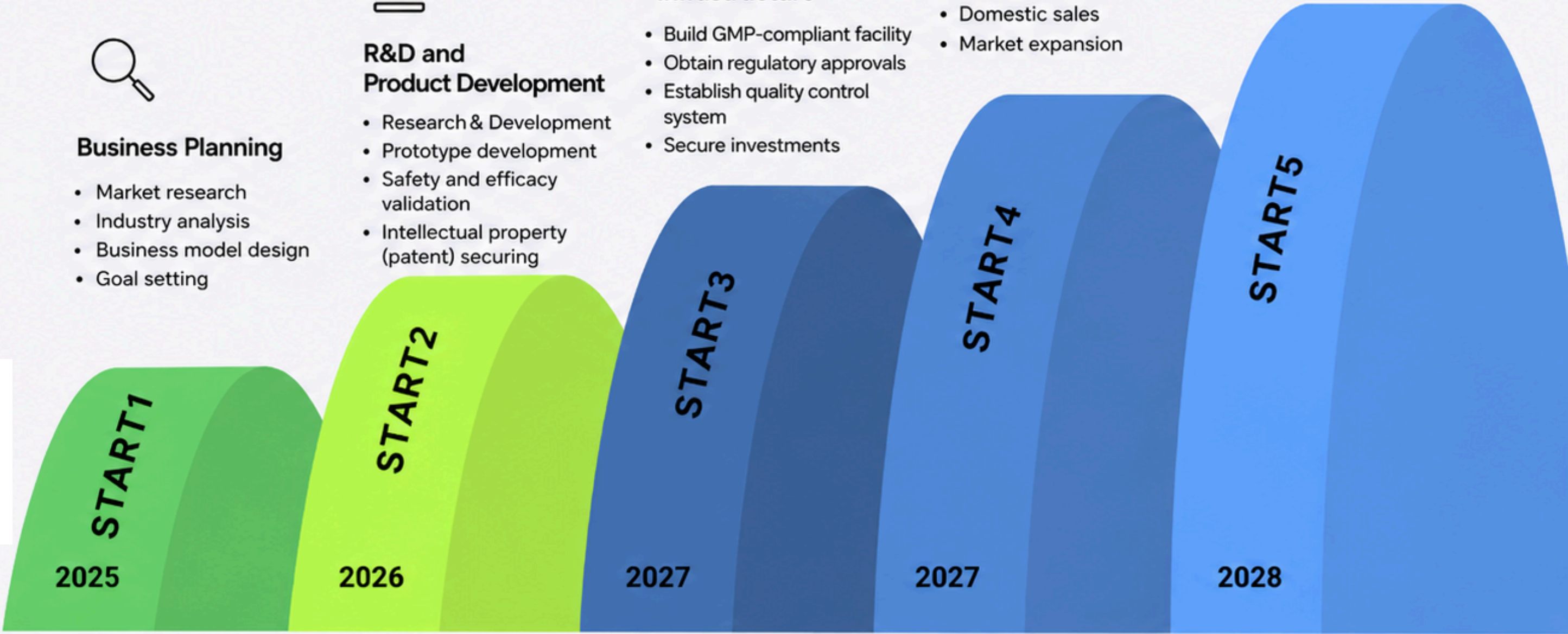
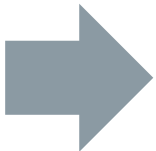
- Launch marine collagen raw material
- B2B marketing
- Domestic sales
- Market expansion



Growth and Expansion

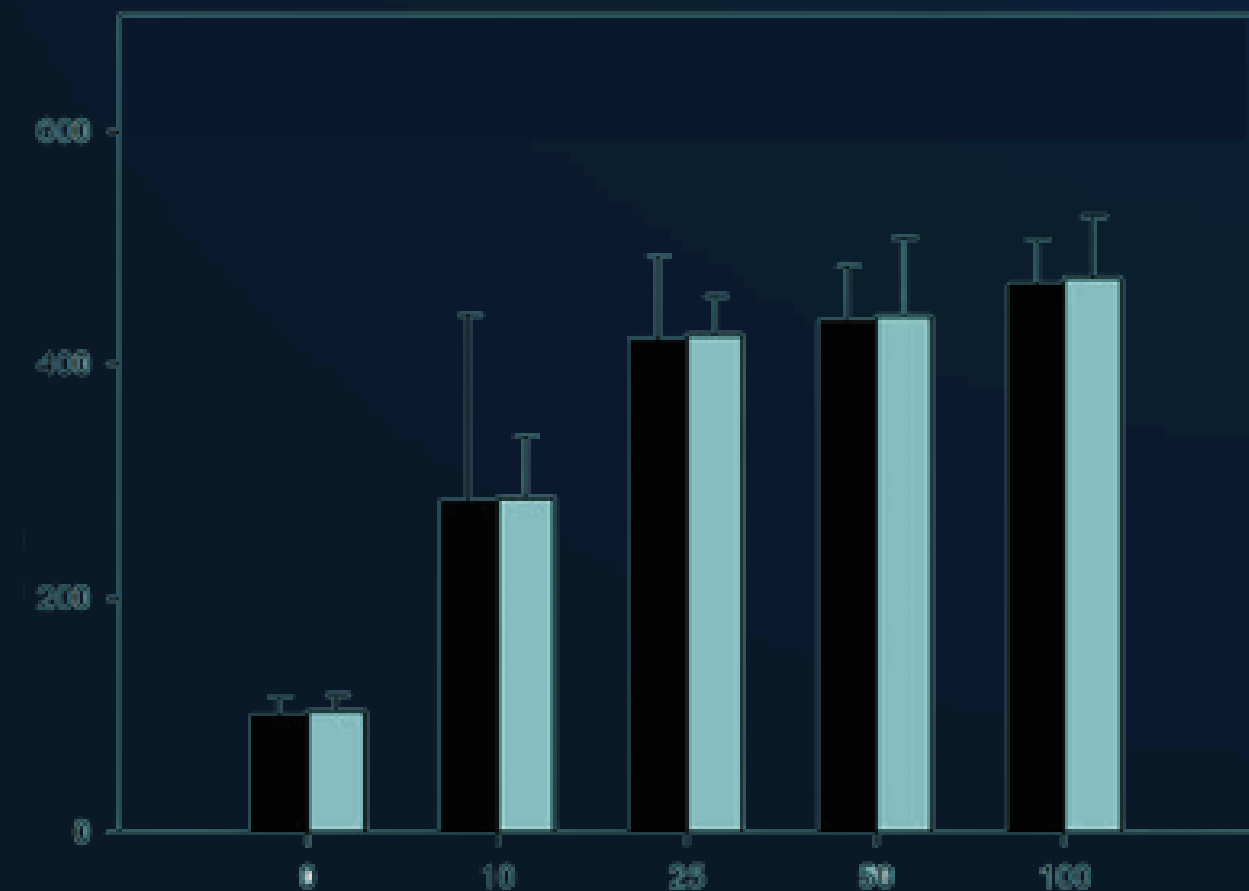
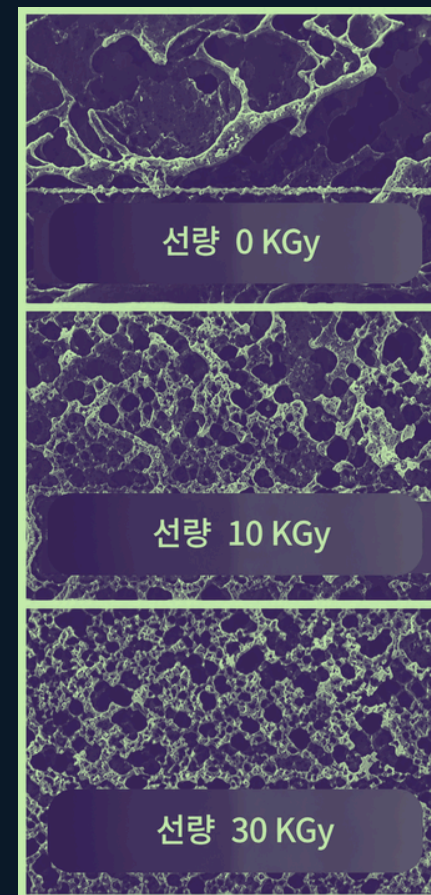
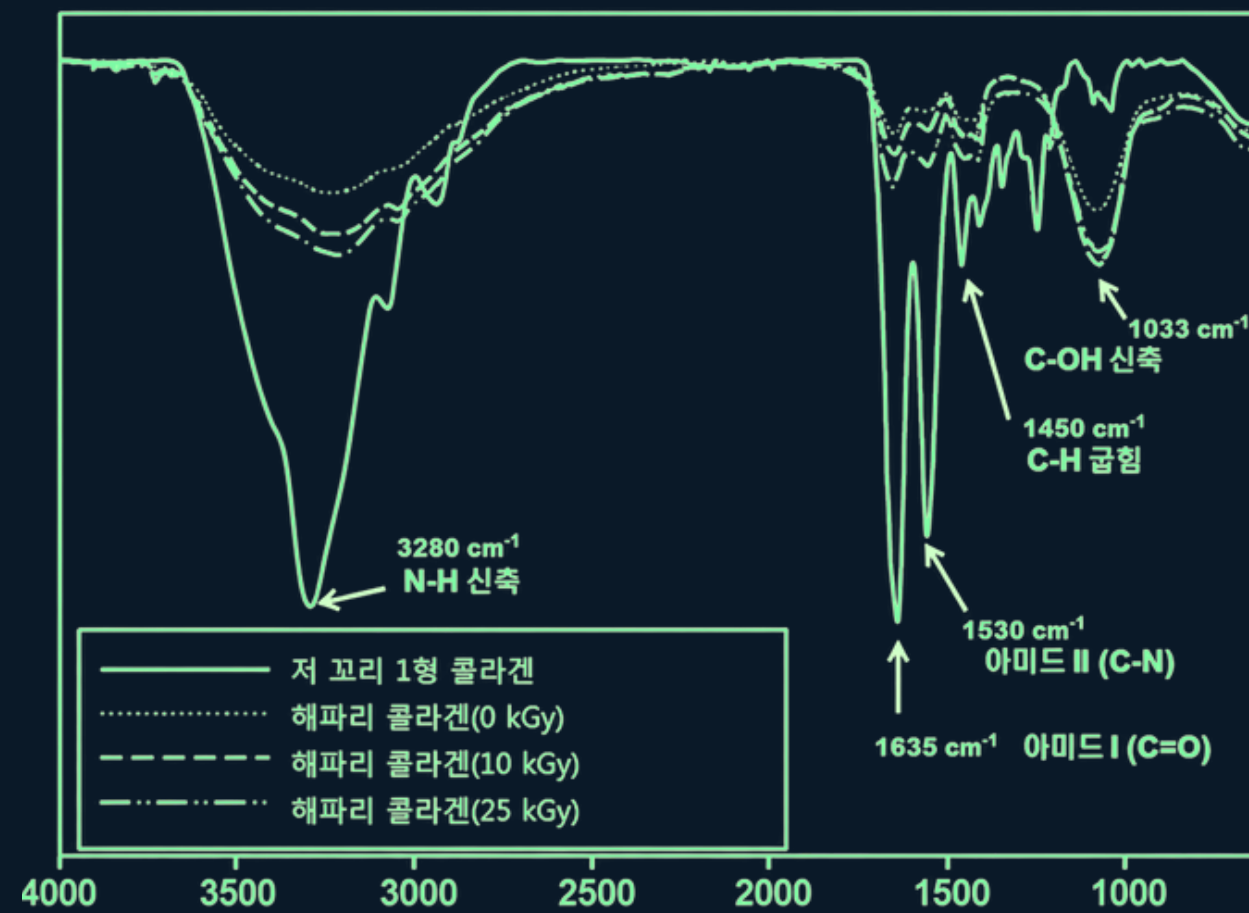
- Diversify business portfolio
- Global market expansion
- Overseas market entry
- Sustainable R&D-driven growth

START



01. Core Patented Technology

Proprietary high-energy beam processes ensuring uncompromised purity

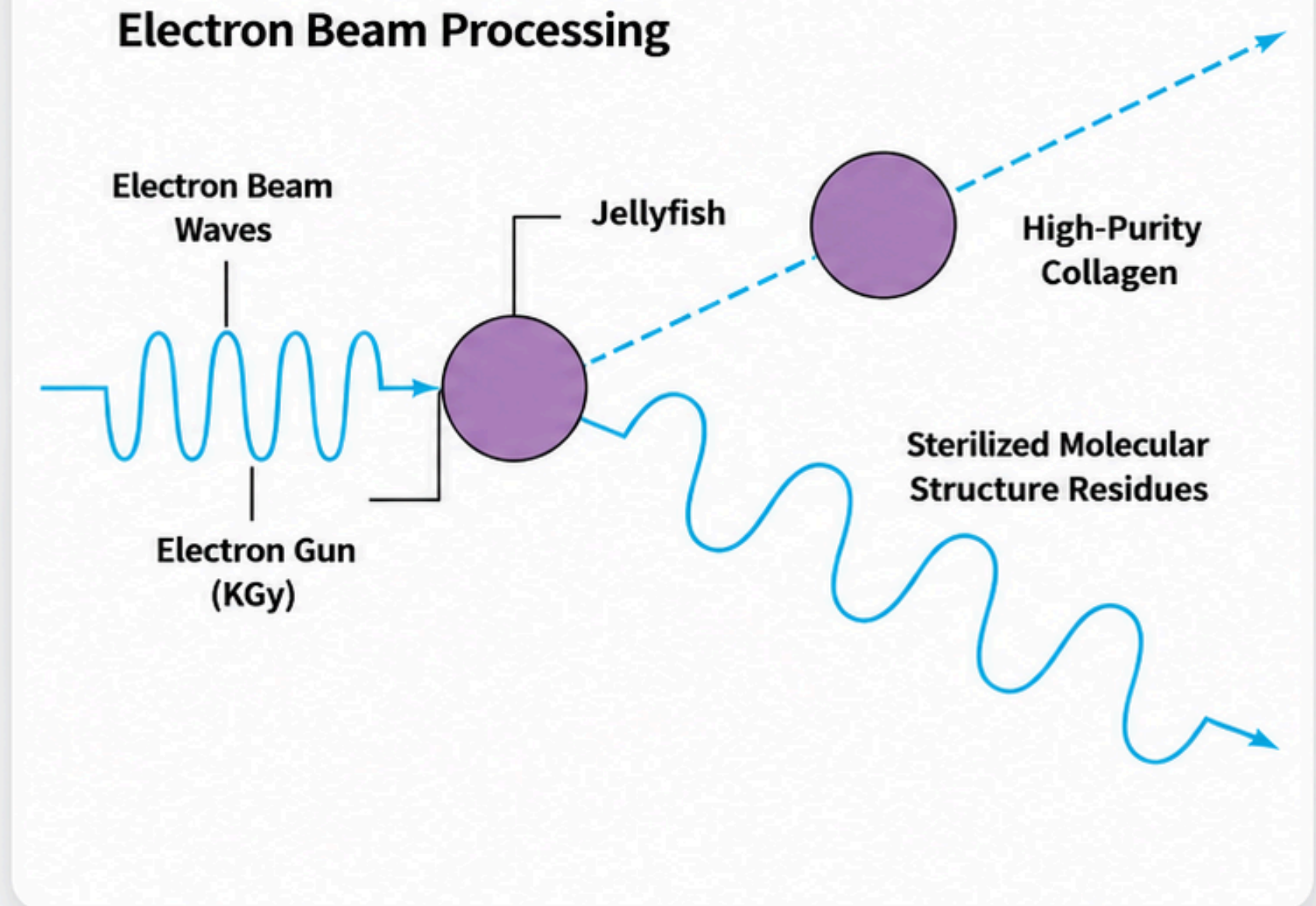


Electron Beam-Based Patented Technology (KAERI)

High-Energy Electron Beam Process

KAERI's patented technology utilizes radiation (electron beams) to extract high-purity collagen from jellyfish and purify it.

- ✓ **High-purity extraction:** Removes impurities without causing damage to the raw material.
- ✓ **Enhanced safety:** Effectively eliminates harmful substances and microorganisms.
- ✓ **Simplified process:** The entire extraction and purification process is completed through electron beam treatment, enabling large-scale production.
- ✓ **Chemical residue-free:** Maintains a clean quality suitable for pharmaceutical-grade standards.



Technology Advantages



Zero Chemical (Zero Chemical)

A technology that leaves no chemical residues, producing the safest high-purity collagen for humans. As a pharmaceutical-grade raw material, it allows for core competitiveness with high potential for expansion.



Maximized Yield (High Efficiency)

The extraction yield according to electron beam dose (kGy) was confirmed to be more than four times higher than conventional methods, which is the core driver of cost competitiveness.



Optimized Molecular Structure

Molecular bonds are precisely controlled to prevent denaturation or reassembly, resulting in high dermal absorption and cellular uptake of collagen (peptides), which is optimized for skin and body absorption.

Functional Mechanism and Biological Benefits

Structural Modification (10-30 kGy)

The collagen structure is finely fragmented through electron beam treatment, resulting in a uniform and highly stable structure.

This process preserves the native protein structure while exposing specific amino acid sequences (such as carboxyl groups) on the surface, enhancing cosmetic formulation and efficacy.

Enhanced Absorption & Moisture Retention

- ✓ **Deep Dermal Absorption:** Low molecular weight peptides penetrate deeply into the dermis and are absorbed more effectively.
- ✓ **Moisture Retention Enhancement:** Micro-structure forms a moisture-binding network, improving skin hydration and long-lasting moisture retention.
- ✓ **Antioxidant Effect:** Reduces free radicals and helps improve skin tone and elasticity.

Proven Extraction Yield Performance

400%

Yield Increase vs. Baseline Methods

Cost Efficiency at Scale

According to certified research data, controlling radiation dosage (kGy) increases extractable collagen yield by over 4-fold compared to conventional chemical methods.

By achieving unprecedented yields from zero-cost ocean raw materials, we create an impenetrable price barrier against competitors.

02. Raw Material Competitive Analysis

Comparing jellyfish-derived collagen to mammalian and marine alternatives



Comprehensive Material Comparison



Metric & Attributes	Jellyfish Collagen (Ours)	Mammalian (Bovine/Porcine)	Fish (Marine) Collagen
Biocompatibility & Safety	Excellent (Highly compatible with human tissue)	Low (High risk of immunogenic rejection/pathogens)	Average
Medical Scaffolding Use	Highly Suitable (High-purity Atelocollagen)	Requires complex, high-cost telopeptide removal	Unsuitable
Cosmetics Market Position	Premium Active / Derma-cosmetics	Commoditized hydration base	Standard active raw material
Production Yield	Very High (400%+ increase via patented method)	Standard	Standard
ESG / Environmental Value	Highly Positive (Protects marine biodiversity)	Negative (High carbon footprints)	Neutral

Efficacy of Jellyfish Collagen



Minimized Immunogenicity

Being evolutionary distant from mammals, jellyfish collagen lacks complex antigens that trigger inflammatory responses in human clinical applications.



Natural Hydration Factors

Consisting of up to 95% water in its live form, the raw matrix has built-in water-binding proteins that deliver unmatched skin moisturization.



Irresistible ESG Story

Directly targeting ocean biodiversity preservation provides an excellent, organic branding story that modern consumer brands aggressively seek.

03. Platform Business Expansion

Deploying a single raw material across three multi-billion dollar markets



Three High-Growth Industries



Cosmeceuticals

High-margin B2B raw materials, concentrated ampoules, and hydrogel sheets focused on skin barrier repair and rejuvenation.



Inner Beauty

Premium marine peptides optimized for maximum intestinal absorption, totally free from heavy metals or mammalian pathogens.



Medical & Bio Materials

Atelocollagen matrices, dermal fillers, sterile scaffolds, and surgical hydrogels targeting deep tissue healing.

Pillar 1: Premium Cosmeceuticals

Micro-Peptides Reaching the Deep Dermis

The global skincare market is actively hunting for clean, sustainable, and highly bio-available ingredients with proven dermal benefits.

- ✓ **Dermal Penetration:** Fragmented into fractions of a pore's size, our micro-peptides bypass the outer barrier effortlessly.
- ✓ **Silky Texture:** Zero-Chemical extraction leaves no irritating chemical salts, resulting in a feather-light, non-sticky feel.
- ✓ **B2B Trajectory:** Undergoing qualification assays with global cosmetic conglomerates for raw material specification listings.



Pillar 2: Premium Nutraceuticals



No Marine Odor, High-Efficiency Absorption

We solve the historic issues of traditional marine collagens—unpleasant fish odors and chemical heavy metal residue concerns.

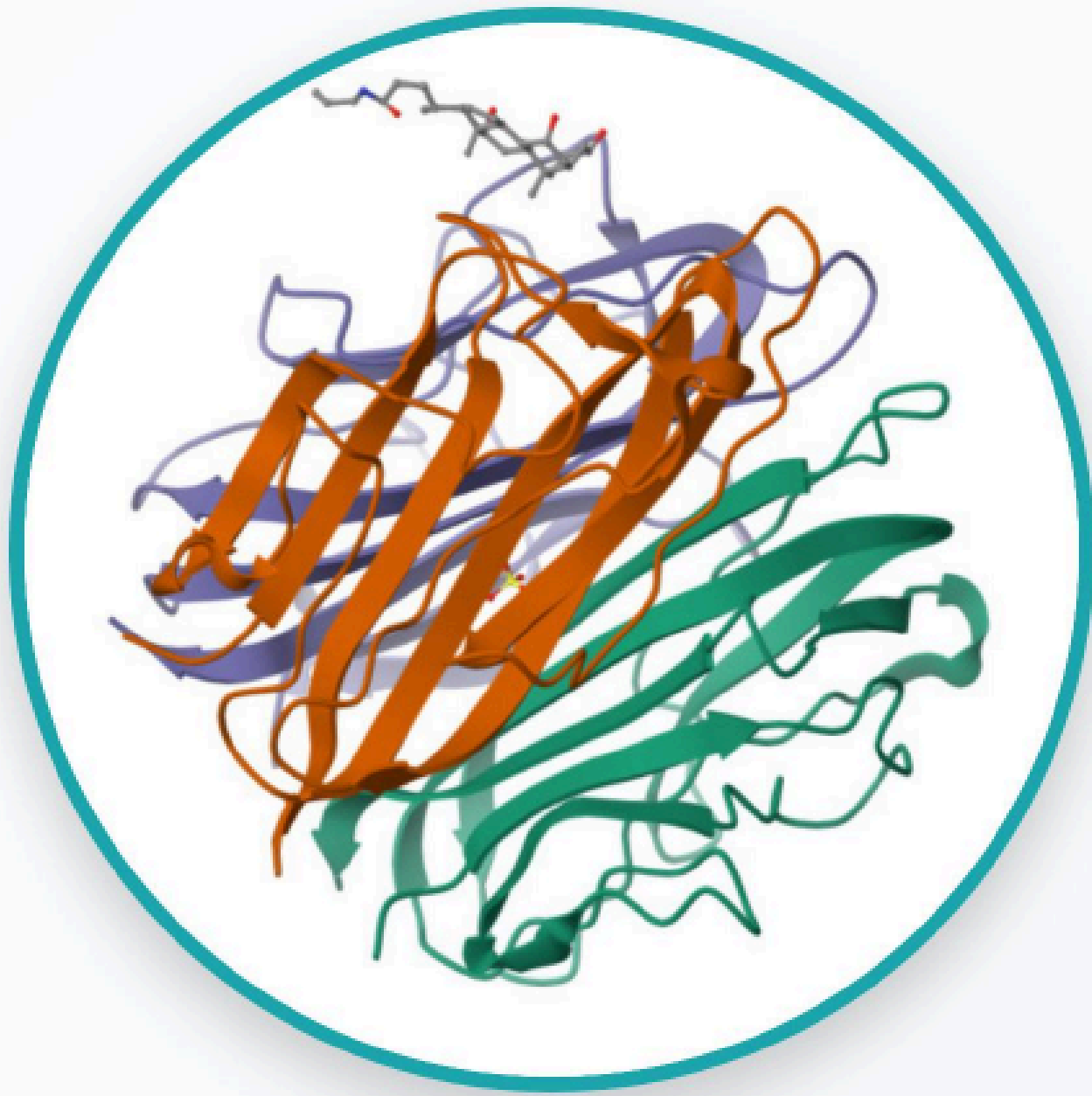
- ✓ **No Offensive Scent:** Electron-beam processing disintegrates trace volatiles, leaving an odorless, clean taste profile.
- ✓ **Superior Bio-Availability:** Low-molecular structure minimizes breakdown losses during digestion, accelerating systemic absorption.
- ✓ **Flexible Customization:** Formulated as dry powder, liquid shots, or stable capsules to accommodate buyer specifications.

04. Medical Applications & Clinical Status

Entering the highest-margin segment of regenerative healthcare



Medical-Grade Atelocollagen



Eliminating Allergenic Antigenicity

Standard animal collagen contains **Telopeptides** at its molecular termini, which trigger intense allergic immune responses in human tissue.

By utilizing advanced enzymes and precise high-energy radiation, we cleave these terminal telopeptides, producing ultra-pure **Atelocollagen**. This high-biocompatibility raw material requires no pre-allergy screening before human implantation.

Main Medical Focus Areas



Aesthetic Dermal Fillers

A natural tissue supplement that not only restores volume but actively triggers autologous fibroblast regeneration within deep skin layers.



Surgical Hemostat & Film

Promotes rapid platelet aggregation at wound sites and is entirely biodegradable, eliminating secondary removal operations.

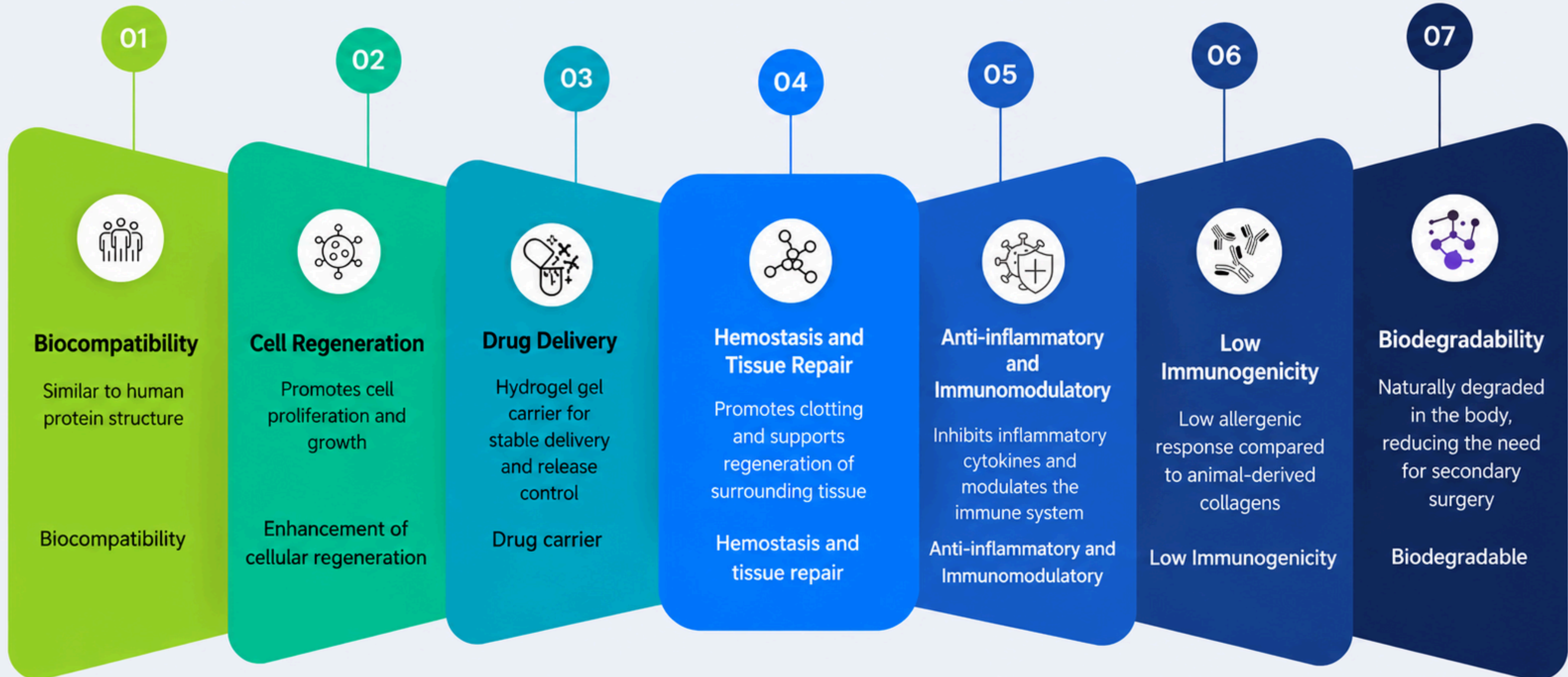


Orthopedic Cartilage Repair

Intra-articular injections targeting musculoskeletal regeneration, directly cushioning damaged joint tendons and cartilage tissue.

| Application Fields of Jellyfish Atelocollagen in Pharmaceuticals

Application Fields of Jellyfish Atelocollagen in Pharmaceuticals



1. Biocompatibility and Tissue Regeneration of Jellyfish Collagen Research Paper

Isolation, Characterization and Biological Evaluation of Jellyfish Collagen for Use in Biomedical Applications

- Addad et al.
- Marine Drugs, 2011
- DOI: 10.3390/md9060967 PubMed

Key Findings

- Structural analysis of jellyfish collagen
- Evaluation of cell adhesion and biocompatibility
- Verification of its potential as a tissue engineering material
- Proposing its potential as an alternative to mammalian collagen

2. Wound Healing and Tissue Repair Research Paper

The Wound Healing Potential of Collagen Peptides Derived from the Jellyfish *Rhopilema esculentum*

- Felician et al.
- Chinese Journal of Traumatology, 2019
- DOI: 10.1016/j.cjtee.2018.10.004 PMC +1

Key Findings

- Promotion of vascular endothelial cell migration
- Acceleration of re-epithelialization
- Increased collagen deposition
- Upregulation of TGF- β 1 and bFGF

3. Diabetic Wound Healing Research Paper

External Administration of Moon Jellyfish Collagen Solution Accelerates Physiological Wound Healing and Improves Delayed Wound Closure in Diabetic Model Mice

- Regenerative Therapy, 2021
- DOI: 10.1016/j.reth.2021.06.008 ScienceDirect

Key Findings

- Topical application of jellyfish collagen
- Increased rate of wound closure
- Improvement of diabetic wounds
- Promotion of re-epithelialization

4. Anti-inflammation and Immunomodulation Research Paper

Mode of Action of the Immunostimulatory Effect of Collagen from Jellyfish

- Nishimoto et al.
- Bioscience Biotechnology and Biochemistry, 2008
- DOI: 10.1271/bbb.80154 PubMed

Key Findings

- Confirmation of the immunomodulatory effects of jellyfish collagen
- Activation of immune cells
- Proposing the potential to modulate biological responses

5. Low Immunogenicity

Research Paper

Jellyfish Collagen: A Promising and Sustainable Marine Biomaterial with Emerging Applications in Food, Cosmetics, and Biomedical

- Applied Food Research, 2025 ScienceDirect

Key Findings

- Jellyfish collagen poses no risk of mad cow disease (BSE) or foot-and-mouth disease (FMD)
- Superior safety profile compared to mammalian collagen
- Reported biocompatibility and low potential for immune responses

6. Advanced Biomedical Hydrogel Research

Research Paper

A Composite Jellyfish Collagen Hydrogel with Skin-Matched Modulus Enables Programmed and High-Quality Wound Healing

- Colloids and Surfaces B: Biointerfaces, 2026 ScienceDirect +1

Key Findings

- Development of a jellyfish collagen hydrogel
- Promotion of cell proliferation and migration
- Antimicrobial properties
- High-quality skin regeneration



Korean Atelocollagen Adoption

Proven Clinical Practice Trends

Atelocollagen injections have become standard in Korean clinics (e.g., Yonsei Farms, Himchan, Narsha, Madi-pyunhan hospitals) as skinboosters or tendon patches.

Clinical practitioners report outstanding patient outcomes with minimal side effects and prolonged cell regenerative activity.

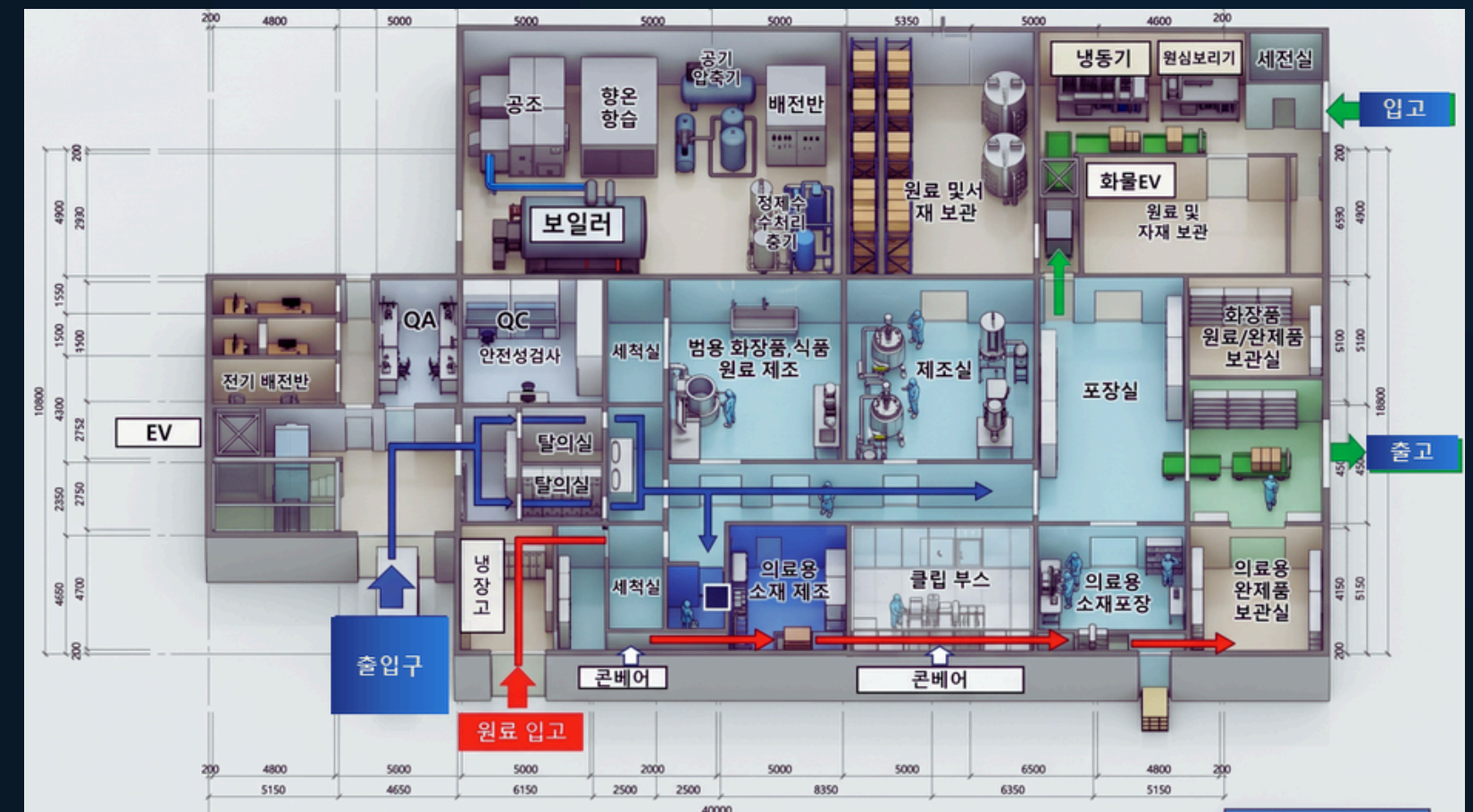
Major Pharmaceutical Commitments

GC Biopharma launched 'Cartisol Prime', an intra-articular atelocollagen injection for osteoarthritis. Other leaders like Dong-A Pharm and Daehwa Pharm are introducing proprietary atelocollagen treatments.

These massive investments confirm the skyrocketing demand for high-quality, pure B2B medical collagen raw materials.

05. Infrastructure & Manufacturing Standards

Establishing medical-grade clean rooms to support global supply contracts



B-GMP Manufacturing Plant

Bio-Industrial Complex in Hwasun

To support global supply partnerships, Haepagen is constructing a state-of-the-art 1,650m² (approx. 17,800sqft) manufacturing facility inside the Hwasun Bio-Industrial Complex in South Korea.

Supervised by former FDA-equivalent Korean MFDS officers, this B-GMP compliant plant features isolated sterile clean rooms, ready for European CE and US FDA certification standards.



06. Market & Financial Projections

Scaling stable B2B cash flows into highly lucrative medical ventures



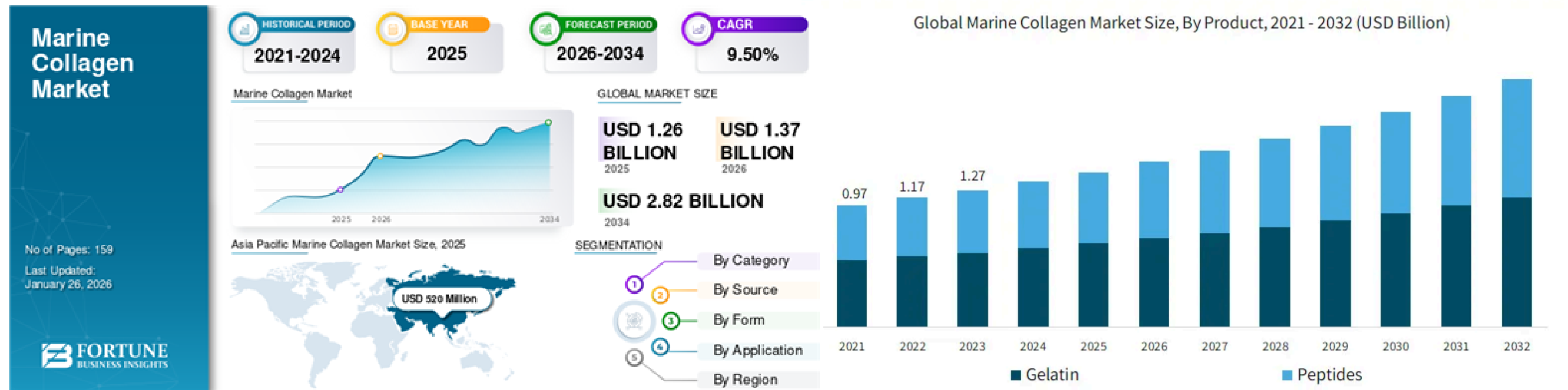
| Global Marine Collagen Market Size and Growth

☐ Domestic Market (korea)

The domestic marine collagen market is projected to grow at a CAGR of 7.8% from 2025 to 2031.
(Source: 6Wresearch)

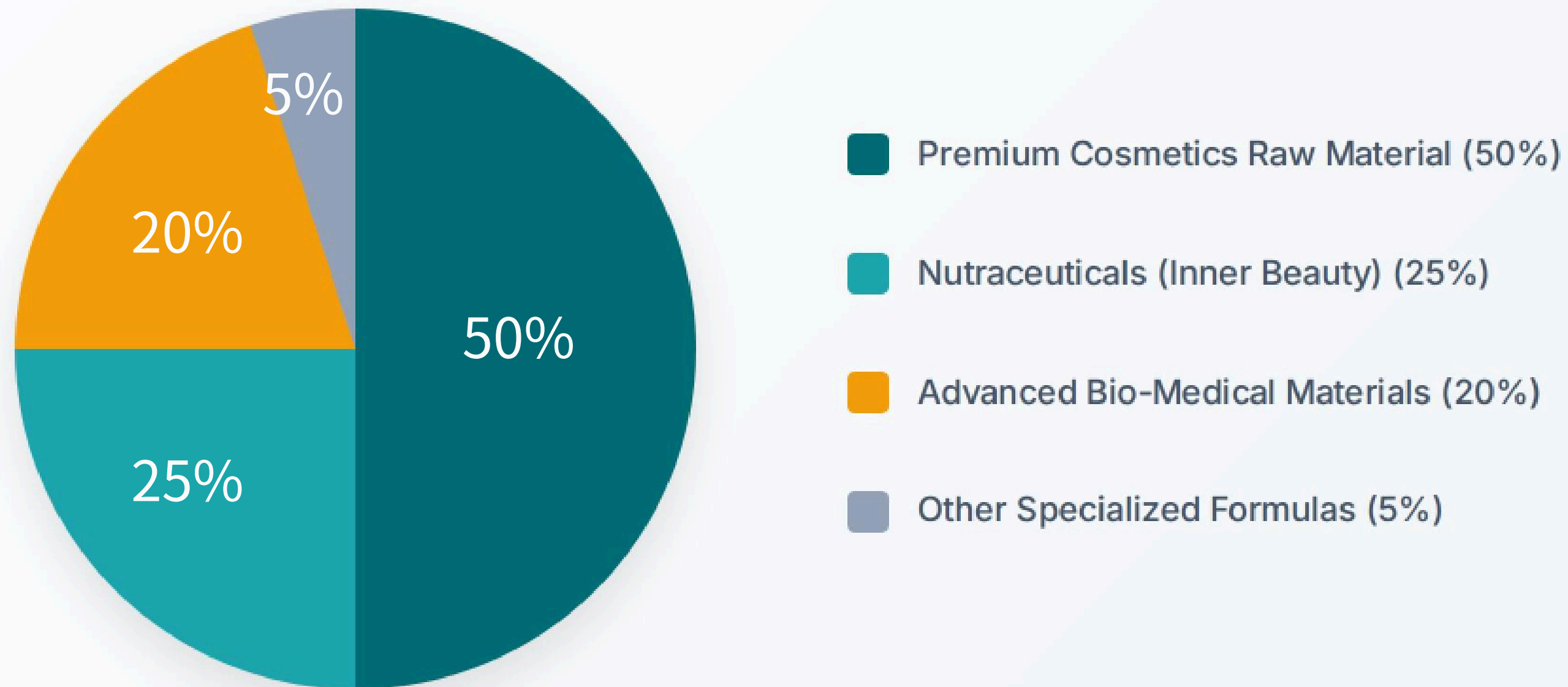
☐ Global Market

The global marine collagen market size was valued at USD 1.26 billion in 2025 and is projected to grow from USD 1.37 billion in 2026 to USD 2.82 billion by 2034, exhibiting a CAGR of 9.50% during the forecast period.
(Source: Fortune Business Insights)



Target Revenue Allocation by Sector

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Revenue Projections (2027~2031)

HAEPAGEN



Securing initial recurring revenues via cosmetics and nutraceuticals B2B supply, followed by explosive hockey-stick growth as medical-grade Atelocollagen enters the market.

Global Dermal Filler Market Potential

Metric & Segment Analysis	Global Anti-Aging Filler TAM	Traditional Market Limitations
2025 Market Valuation	Approx. USD 6.2 Billion	Hyaluronic Acid (HA) has high foreign-body sensation and short durability.
2033 Projected Valuation	Approx. USD 14.2 Billion	Traditional mammalian collagens face soaring raw material costs and zoonotic pathogen concerns.
Expected CAGR	Over 10.9% (Consistent rapid expansion)	The global sector is aggressively demanding high-purity, bio-safe, non-mammalian alternatives.

07. Investment & Global Scale-Up

Partnership opportunities yielding robust environmental and commercial returns



Strategic Implementation Roadmap



Phase 1: R&D

Exclusive KAERI IP transfer,
cosmetic and inner-beauty
ingredient approvals.



Phase 2: CAPEX

Pre-A funding closing, complete
construction of Hwasun B-GMP
production lines.



Phase 3: Launch

Execute B2B raw material shipping
contracts with major global
skincare and supplement brands.



Phase 4: Medical

CE/EMA clinical submissions,
launching aesthetic and tissue
regenerative Atelocollagen globally.

Funding Strategy & Use of Proceeds

Structured Investment Opportunities

We are initiating our Pre-A / Seed financing rounds, inviting institutional VCs and impact funds via Flexible SAFE (Simple Agreement for Future Equity) and Convertible Notes (CB).

- ✔ **Round Target:** Biotech and ESG-focused global VCs.
- ✔ **Strategic Support:** Accelerated commercial scaling and technology cross-licensing.

Highly-Targeted Fund Allocation

- ✔ **CAPEX (60%):** Construction of the B-GMP facility and custom high-energy electron beam reactors.
- ✔ **R&D & Clinical (25%):** Joint clinical trials with GIST, securing CE and FDA medical certificates.
- ✔ **Global Expansion (15%):** Establishing international offices, marketing, and distribution.

Key Investor Value Proposition



Strong Technology Moat

Our exclusive partnership and IP from KAERI creates a robust legal barrier, blocking generic competitors from cloning our yields.



70%+ Operating Margins

Abundant, zero-cost marine raw materials combined with high-yield patents ensure exceptional profit retention.



Clear Exit Strategies

We target robust shareholder dividend returns by 2030, alongside prospects for a specialized medical IPO or global M&A exits.

Global Alliance & Market Expansion

Securing Strong International Networks

Our ecological marine technology has caught the attention of major global beauty and life sciences players.

- ✔ **Beauty Times USA Partnership:** MOU executed to distribute premium raw materials into the North American cosmetics and hair-care markets.
- ✔ **European Collaboration:** Partnering with key bio-scaffold developers in Western Europe to replace mammalian-derived materials under EU Green Deal initiatives.



Thank You.

Restoring marine life, creating a new standard for sustainable biomaterials.



Ki Dong-ho , CEO



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