

Investment Feasibility Research Report:

Development and Industrialization Project of Novel Collagen Products

January 2026

Beijing Triprime Gene Pharmaceutical Co.,
Ltd. Beijing CollaRegen Biotechnology Co.,
Ltd.

Initial Round of Capital Increase

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Chapter 1: Executive Summary

Project Name: Development and Industrialization Project of Novel Collagen Products

Investing Entity: Beijing CollaRegen Biotechnology Co., Ltd.

Company Address: No. 1 Jinyuan Road, Daxing Economic Development Zone, Beijing

Legal Representative: Zhou Yingqi

Project Contact: Li Yang

Section 1: Executive Summary

a. Transaction Overview

This project aims to accelerate the industrialization of recombinant human collagen protein products by Beijing CollaRegen Biotechnology Co., Ltd. ("CollaRegen" or "Target Company") through an equity capital increase. Hainan Triprime Pharmaceutical Co., Ltd. ("Hainan Triprime") will act as the lead investor.

- **Investment Target :** Beijing CollaRegen Biotechnology Co., Ltd.
- **Registered Capital :** RMB 2.5 million
- **Registered Address :** No. 1 Jinyuan Road, Daxing Economic Development Zone, Beijing
- **Total Funding in This Round :** RMB 30.5 million
- **Post-Money Valuation :** RMB 110.5 million (initial round valuation)
- **Hainan Triprime' s Investment Plan :**
 - **Investment Amount :** RMB 15.25 million
 - **Use of Funds :** RMB 0.476563 million to be recorded as registered capital; the remainder to capital reserve.
 - **Equity Stake :** Upon completion, Hainan Triprime will hold 21.0407% of the company' s equity, becoming the largest institutional shareholder outside the founding team.
- **Use of Raised Funds :** Primarily for R&D of recombinant collagen protein series products, registration of Type I and Type XVII raw material master files, and construction of a 200L pilot production line.

b. Core Investment Thesis and Strategic Synergy

This investment represents a strategic move by Hainan Triprime ' s parent company (Beijing Triprime Gene Pharmaceutical Co., Ltd.) in the biopharmaceutical sector, offering significant industrial synergy and high technical barriers.

1. Strategic Complementarity (1+1>2)

Triprime Gene' s flagship product, "Yundesu," focuses on immune modulation and antiviral therapy with broad hospital applications. CollaRegen ' s recombinant collagen specializes in tissue architecture repair. Together, they form a combined "serious medicine + consumer medicine" marketing strategy, significantly

enhancing Triprime Gene' s clinical development in dermatology, wound healing, and anti-aging, and completing its product portfolio in dermatology and aesthetic medicine.

2. Generational Technological Advantage

CollaRegen has overcome bottlenecks of mainstream microbial fermentation technology by pioneering a mammalian cell expression system (CHO and HEK293 cells). It has successfully developed full-length, triple-helical recombinant human Type II and Type III collagen proteins with purity exceeding 95% (Medical Device Master File No.: M2025423, M2025428, M2025429, M2025431; Cosmetic Ingredient Notification Code: 003417-15123-5748). This technology yields proteins with higher bioactivity, lower immunogenicity, and stronger structural support, addressing key pain points in aesthetic fillers and cartilage repair.

3. Production Resource Reuse

Triprime Gene' s mature gene-engineered drug formulation platform (cell culture, drug screening, etc.) can directly empower CollaRegen. Currently, CollaRegen uses existing facilities for small-scale R&D and pilot production. Future upgrades to the Jinyuan Road facility will rapidly scale up both formulation and raw material production capacity.

c. Market Outlook and Product Pipeline

China' s recombinant collagen market is in an explosive growth phase, projected to reach RMB 108.3 billion by 2027. The target company has a clear, high-value product pipeline covering the entire chain from raw materials to Class III medical devices:

- **Near Term (2026)** : Launch Type III collagen raw materials and premium functional skincare products to quickly generate cash flow.
- **Mid Term (2027)** : Launch the world' s first collagen-based cartilage repair scaffold (Class III medical device) and biomedical innovations (e.g., stem cell-collagen hydrogels) to address the clinical challenge of articular cartilage regeneration.
- **Long Term (2028)** : Launch aesthetic injectable fillers (Class III medical device) to replace traditional hyaluronic acid and capture a share of the trillion-yuan aesthetic market.

d. Financial Return Forecast

Detailed projections indicate the project features high gross margin, high returns, and strong risk resilience:

- **Revenue Scale** :
 - **2026 (Launch Year)** : Projected revenue of RMB 69.1 million. This can be achieved by selling just 22kg of raw materials (via self-operation or co-development), quickly validating the business model.
 - **2030 (Explosive Growth)** : With the launch and scaling of Class III medical devices (fillers/scaffolds), revenue is expected to exceed RMB 1.16 billion, marking a transition from a ten-million to a billion-yuan enterprise.
- **Profitability** : A comprehensive gross margin of approximately 70%, reflecting the strong pricing power of recombinant collagen as a "premium biomaterial."
- **Net Profit** : Expected to achieve a net profit in the tens of millions in 2026 (after high R&D expenses), growing to hundreds of millions by 2030, with a net profit margin consistently above 28%.
- **Investment Return** :

- **Internal Rate of Return (IRR)** : Post-tax IRR is approximately 29.8%, far exceeding the biopharma industry benchmark of 12%.
- **Payback Period** : Estimated at 3.23.5 years. This means investors can recover their full principal by around 2029, i.e., the second year after the Class III device launch.
- **Break-Even Point (BEP)** : In 2026, a capacity utilization rate of only 60% (i.e., selling ~ 13kg of raw materials or equivalent finished goods) is sufficient to break even, demonstrating a very high safety margin.

e. Risk Control and Transaction Safeguards

To maximize the security of Hainan Triprime’s capital, this transaction includes stringent legal risk control clauses:

- **Conditions Precedent to Payment** : Before Hainan Triprime disburses funds, the target company must complete the Medical Device Master File (DMF) registration for recombinant human Type II and Type III collagen. If not completed within 10 days of signing, Hainan Triprime has the right to terminate the agreement.
- **Dual Earn-Out Mechanisms** :
 - **R&D Earn-Out** : If the DMF registration for Type I and Type XVII raw materials is not completed by June 30, 2026, the investor has the right to request a valuation adjustment.
 - **Anti-Dilution Protection** : If a subsequent financing round occurs at a valuation below the current post-money valuation (RMB 110.5 million), the investor is entitled to equity compensation.
- **Veto Power** : Hainan Triprime will have a seat on the Board of Directors, and the agreement stipulates that all board and shareholder resolutions require unanimous consent, ensuring the investor’s substantive control over major matters.
- **Exit Safeguards** : The investor enjoys liquidation preference (priority over founders in recovering 100% of principal) and tag-along rights, ensuring flexible exit options before and after an IPO.

f. Conclusion and Recommendations

Conclusion : In summary, the Beijing CollaRegen capital increase project boasts globally leading “full-length triple helix + mammalian cell expression” dual technological barriers. It exhibits strong strategic synergy with Hainan Triprime’s parent company, offers generous financial returns, and has comprehensive risk control measures.

Recommendation : Proceed with fund disbursement and closing as per the agreement, upon confirmation that the target company has fulfilled the DMF registration condition precedent.

Section 2: Macro Environment and In-Depth Industry Analysis

a. In-Depth Analysis of Industrial Policy

1. From “Naming Standardization” to “Substance Compliance”

China’s biopharma and medical device industry is undergoing regulatory restructuring. The regulatory focus on collagen has shifted from early-stage innovation encouragement to strict classification management and standardization. This trend is clearing out “pseudo-concept” products and creating vast market space for “true collagen” enterprises with core technical barriers.

The NMPA’s regulatory logic has evolved through a clear path: “Standardize Naming ★ Define Categories ★ Establish Standards ★ Raise Barriers.”

- **2021** : Top-level design established. The NMPA issued the *Guiding Principles for Naming Recombinant Collagen Biomaterials* , defining “recombinant human collagen” (full-length, triple helix) vs. “recombinant humanized collagen” (fragmented, no helix) to combat concept abuse.
- **2022** : Review standards refined. The NMPA’s Center for Medical Device Evaluation issued the *Technical Review Points for Recombinant Humanized Collagen Injectable Materials for Aesthetic Use (Trial)* , classifying them as Class III medical devices and significantly raising entry barriers.
- **2023** : Industry standards implemented. Standards like YY/T 1888-2023 (*Recombinant Humanized Collagen*) and YY/T 1849-2022 (*Recombinant Collagen*) were enacted, setting quantifiable requirements for biological evaluation, stability, and quality control.

Table 2-1: Key Laws and Regulations Related to Collagen

Issuance Date	Issuing Department	Policy Name	Main Content
July 2023	NMPA	YY/T 1888-2023 <i>Recombinant Humanized Collagen</i>	Specifies QC, technical requirements, test methods, stability, and biological evaluation for recombinant humanized collagen as a medical device raw material.
May 2023	NMPA	<i>Guidance on Registration Review for Recombinant Collagen Wound Dressings</i>	Applies to Class II medical device wound dressings, detailing requirements for regulatory info, summaries, non-clinical data, clinical evaluation, and labeling.
May 2023	NMPA	<i>Guidance on Evaluation of Recombinant Humanized Collagen Raw Materials</i>	Clarifies performance, immunological safety, biological risk, and stability studies for raw materials.
Aug 2022	NMPA	<i>Recombinant Collagen Industry Standard</i>	Specifies QC requirements, test indicators, and methods for recombinant collagen as a medical device raw material.
Apr 2021	NMPA	<i>Principles for Classification of Recombinant Collagen Medical Products</i>	Stipulates that recombinant collagen products are managed as at least Class II. As non-active implants, they are Class III.
Mar 2021	NMPA	<i>Guiding Principles for Naming Recombinant Collagen Biomaterials</i>	Defines three categories of recombinant collagen and mandates a “Feature Word + Core Word (A+B)” naming convention.

2. Latest Regulatory Trends and Future Outlook

Regulation is evolving from simple device management to governing novel biomedical technologies.

- **New National Standard** : YY/T 1947-2025 (*Recombinant Collagen Dressings*) will take effect in March 2026, further regulating the chaotic medical dressing market.
- **National Regulation** : In September 2025, the State Council passed the *Regulations on Clinical Research and Translation of Novel Biomedical Technologies* , effective May 1, 2026. This provides a clear legal basis and fast track for CollaRegen' s pipeline in cartilage repair and organ regeneration.
- **Shift in Review Focus** : Regulators are moving from scrutinizing "product claims" to verifying "material essence." Future reviews will emphasize confirmation of the triple-helix structure and completeness of biological function.

b. Panoramic View of the Collagen Protein Industry

1. Market Size: The "Golden Replacement Era" for Recombinant Collagen

Global and Chinese market data show recombinant collagen' s growth has surpassed animal-derived collagen, with penetration rising rapidly.

- **Global Market** : The global collagen market reached \$18.9 billion in 2023 and is projected to grow to \$30.5 billion by 2027 (CAGR 12.7%). Recombinant collagen' s penetration surged from 18.5% in 2020 to 52.6% in 2025, driven by its ultra-low allergenicity (<0.5%) vs. animal sources (>12%).
- **Chinese Market** : In 2023, the domestic recombinant collagen market was RMB 28.63 billion, nearly equal to animal-derived (RMB 29.79 billion). However, recombinant collagen' s CAGR (2023-2027) is projected at 41.4%, far exceeding animal-derived (27.7%). By 2027, it will dominate the market.
- **Sub-sector Boom** : In the aesthetic injection segment, recombinant collagen is expected to grow from RMB 4.3 billion in 2023 to RMB 14.3 billion by 2027 (CAGR 35.4%).

2. Technology Roadmap: Three Generational Leaps

The industry has evolved from natural extraction to genetic recombination and is now at a critical juncture transitioning from "microbial fermentation" to "mammalian cell expression."

- **First Generation: Animal-Derived Collagen**
 - **Representatives** : Taiwan Sunmax, Changchun Botai.
 - **Pros** : Natural triple-helix structure, good support.
 - **Cons** : Viral risks (e.g., BSE), high immunogenicity, batch variability, high cost.
 - **Status** : Market share growth is slowing, being replaced by recombinant tech.
- **Second Generation: Microbial Fermentation Recombinant Collagen**
 - **Representatives** : Jinbo Bio, Giant Biogene, Jiangsu Wuzhong.
 - **Path** : Uses *E. coli* or yeast.
 - **Pros** : Solves viral risks, scalable.

- **Cons** : Produces single-chain, fragmented peptides (e.g., Jinbo' s Veyisome is 4kDa/54.5kDa fragments). Lacks full-length sequence and stable triple-helix, leading to rapid degradation, weak support, and only signal transduction function. Cannot perform complex post-translational modifications (e.g., hydroxyproline formation), resulting in lower bioactivity.
- **Third Generation: Mammalian Cell Expression Recombinant Collagen — CollaRegen' s Path**
 - **Representative** : Beijing CollaRegen
 - **Path** : Uses CHO (Chinese Hamster Ovary) and HEK293 (Human Embryonic Kidney) cells, combined with AI-assisted design.
 - **Disruptive Advantages** :
 - **Structural Integrity** : Achieves 100% identical full-length amino acid sequence to human natural collagen, with a complete native triple-helix structure.
 - **Functional Authenticity** : Can self-assemble into collagen fibers, forming a functional extracellular matrix (ECM) to provide a real environment for cell adhesion and proliferation, enabling true tissue repair and regeneration.
 - **High-Yield Breakthrough** : CollaRegen has overcome the industry' s low-yield bottleneck, achieving an efficient expression of 2g/L, enabling commercial-scale production.

3. Competitive Landscape and Opportunities

While the domestic recombinant collagen competitive landscape is crowded, most capacity is concentrated in second- generation (fragmented) technology, leading to severe product homogenization, primarily competing in dressings and light-aesthetic markets.

- **Blue Ocean Opportunity** : Full-length, triple-helix, high-support recombinant collagen is extremely scarce. CollaRegen' s products can not only cover the traditional filler market but also expand into high-barrier fields like cartilage repair, artificial blood vessels, and organ regeneration! areas inaccessible to microbial fermentation collagen.
- **International Benchmarking** : International PCPC standards are clear. Many domestic "collagen" products are actually just "recombinant human peptides," whose structural and functional deficiencies limit their high-end applications. CollaRegen' s "name equals essence" strategy gives it an absolute advantage in future international competition and compliance waves.

c. In-Depth Analysis of Sub-Sectors

1. Aesthetic Filler Segment: Ending "Physical Occupation," Starting "Physiological Regeneration"

According to Deloitte and Frost & Sullivan, China' s non-surgical aesthetic market is dominated by injectables. Recombinant collagen in this segment is projected to grow from RMB 4.3 billion in 2023 to RMB 14.3 billion by 2027 (CAGR 35.4%), far outpacing the overall injectable market.

- **Market Pain Points** :
 - **Hyaluronic Acid (HA)** : Offers physical support but causes the "Tyndall effect" (translucency), swelling, and cannot repair damaged tissue ("inert filler").
 - **Animal Collagen** : Has support but carries immunogenic rejection (allergy rate >12%) and viral risks.

- **Ordinary Recombinant Collagen** : Mostly single-chain fragments on the market lack a triple-helix structure, have weak support, degrade too quickly, and are mainly used as water-light needles, unsuitable for deep filling.
- **CollaRegen' s Disruptive Advantage (Class III Medical Device)** : CollaRegen' s recombinant full-human Type III collagen filler, expressed via mammalian cells, achieves a natural triple-helix structure with core competitiveness:
 - **Support & Longevity** : Storage modulus reaches 270~300Pa, with mechanical strength comparable to animal collagen, enabling deep contouring and shaping.
 - **Natural Aesthetics** : Milky white in color, no Tyndall effect after injection, and less hydrophilic than HA, resulting in no post-op swelling and a natural look.
 - **Regenerative Function** : Not just a physical filler, but also activates cell signaling to induce autologous collagen regeneration, achieving a "fill + nourish + repair" triad.

2. Efficacious Skincare & Dressing Segment: Overwhelming Competition with Ultimate Safety

Efficacious skincare is the segment with the highest current penetration for collagen. China' s efficacious collagen skincare market was RMB 11.5 billion in 2023 and is projected to explode to RMB 66.5 billion by 2027 (CAGR 54.9%).

- **Niche Entry Point: Ultimate Safety (Infant & Sensitive Skin)**

While the general skincare market is fiercely competitive, the high-end repair market for infants and extremely sensitive skin remains a blue ocean. Leveraging its recombinant full-human collagen' s "zero viral risk and ultra-low immunogenicity (<0.5%)," CollaRegen has developed a "Zhen' ai" (Cherish) series of infant anti-allergy skincare under the Yundesu brand.

- **Product Logic** : Unlike traditional infant products that rely solely on occlusives for moisturization, CollaRegen' s products repair the damaged barrier at the cellular level, addressing stubborn issues like atopic dermatitis (eczema) and meeting the upgraded demand of educated families for "active repair."

3. Tissue Engineering & Serious Medicine: A Trillion-Yuan "Second Growth Curve"

This is CollaRegen' s core differentiator from most "consumer-oriented" collagen companies.

- **Orthopedic Repair (Cartilage Regeneration)** :

- **Pain Point** : Articular cartilage defects (e.g., osteoarthritis, sports injuries) are a clinical challenge, as traditional therapies struggle to regenerate hyaline cartilage. There are over 300 million patients globally.
- **Solution** : CollaRegen' s recombinant Type II collagen multimodal scaffold (Class III medical device) mimics the natural cartilage ECM environment to guide autologous bone marrow mesenchymal stem cells (BMSCs) to differentiate and regenerate, a highly innovative solution globally.

- **Organoids & Flexible Electrodes** :

- **Tech Breakthrough** : Using collagen wet-spinning technology, CollaRegen has developed small-diameter artificial blood vessels/neural conduits (0.7mm-6mm) with a mechanical strength of 2MPa, solving the thrombosis problem of small-diameter vessels.

- **Application** : Includes artificial blood vessels, neural conduits, semi-invasive flexible electrodes, and 3D-printed heart valves, avoiding allograft rejection and enabling functional reconstruction of damaged tissues.

4. Emerging Blue Oceans: Gynecology & Hair Health

- **Female Anti-Aging** : As female health awareness rises, the market is projected to grow from RMB 34.6 billion in 2024 to RMB 80 billion by 2030. CollaRegen’s recombinant collagen gels, hemostatic sponges, and lyophilized fibers for vaginal mucosa repair, assisted reproduction, and post-op hemostasis fill a gap in high-end biomaterials.
- **Hair Health (Anti-Hair Loss)** : Research shows that Type XVII collagen deficiency is a primary cause of hair follicle atrophy and graying. CollaRegen’s pipeline for recombinant Type XVII collagen could open a new biological treatment path in the trillion-yuan anti-hair loss market.

d. Competitive Landscape Analysis of the Collagen Protein Industry

1. Raw Material Competition Landscape

Sunmax’s porcine collagen was the first aesthetic injectable in China, based on US bovine extraction tech, launched in Taiwan in 2008 and on the mainland in 2009. In 2021, Jinbo Bio’s Veyisome became China’s first approved recombinant collagen aesthetic injectable, sparking a wave. Companies like Giant Biogene, Juyuan Bio, and Chuangjian Medical are accelerating their registration filings.

Table 2-2: Chinese Companies in the Collagen Raw Material Space

Type	Company	Collagen Type
Recombinant	Juyuan Bio	I, III, IV, V, XVII
Recombinant	Giant Biogene	I, II, III (full-length)
Recombinant	Jinbo Bio	III, XVII
Recombinant	Jiangsu Wuzhong	III
Recombinant	Chuangjian Medical	I, II, III, XVII
Recombinant	Marubi Bio	I & III (dual)
Recombinant	Meibai Bio	I, III
Animal-Derived	Chuang’er Bio	Porcine, Bovine (recombinant in R&D)
Animal-Derived	Beidi Bio	Bovine
Animal-Derived	Yierkang (acquired by Bloomage)	Bovine
Animal-Derived	Peiqilong (acquired by Aimoon)	Porcine

Table 2-3: Comparison of Collagen Raw Material Parameters

	CollaRegen	Jinbo Bio	Chuangjian Medical	Juyuan Bio	Sunmax
Collagen Type	100% homologous to human gene sequence	Fragmented repeat sequence	Small active peptide (5kDa)	Large fragment (54.5kDa, 498 aa)	Porcine I/III, telopeptide removed
Structural Integrity	Triple helix, self-assembles into fibers	Characteristic 164.88 < bend in triple helix domain	No higher-order structure	No higher-order structure	Complete triple helix
Functional Authenticity	Functional ECM supporting cell growth	Fragmented function	Signal transduction only	Signal transduction only	Functional ECM
Immunogenic Risk	Extremely Low	Low	Low	Low	Some allergy risk from animal source
Tech Platform	Mammalian cell expression + AI	<i>E. coli</i>	<i>Pichia pastoris</i>	<i>Pichia pastoris</i>	2nd-gen SPF pig skin extraction

2. Key Industry Players

- **Giant Biogene (02367.HK)** : Founded in 2001, strong R&D in recombinant collagen, with products in efficacious skincare, medical devices, and functional foods.
- **Jinbo Bio (832982.BJ)** : Founded in 2008, focuses on life-health new materials and antivirals, with a full chain from recombinant proteins to medical devices and skincare.
- **Chuangjian Medical (873474.NQ)** : Founded in 2015, focuses on novel biomaterials and innovative protein /nucleic acid drugs, with a full chain from raw materials to medical devices and skincare.
- **Marubi Bio (603983.SH)** : Founded in 2002, focuses on eye care and biological anti-aging, with self-developed recombinant collagen for skin aging.
- **Jiangsu Jiangshan Juyuan Bio** : Founded in 2015, focuses on biotech R&D for cosmetics and medical devices, serving global markets.
- **Beijing Meibai Pharma** : Founded in 2019, focuses on regenerative biomaterial scaffolds for maxillofacial repair and aesthetic medicine.

Section 3: Target Company Profile

a. Company Introduction and Equity Structure

Beijing CollaRegen Biotechnology Co., Ltd. was founded on September 1, 2025, with a registered address at Room 301, Building 4, No. 1 Jinyuan Road, Daxing District, Beijing. The legal representative is Zhou Yingqi, with a registered capital of RMB 2.5 million.

Pre-Investment Equity Structure:

Shareholder Name	Capital Contribution (RMB 10k)	Equity Stake (%)
Hainan Hongrui Biotech Co., Ltd.	127.5	51.0
Li Yang	72.5	29.0
Hainan Triprime Pharmaceutical Co., Ltd.	25.0	10.0
Jin Xingyi	8.35	3.34
Wang He	8.325	3.33
Xian Lili	8.325	3.33
Total	250.0	100.0

b. Core Scientists’ Backgrounds

- **Zhang Zhijie (R&D Director)** : Former GM of Hainan Duoyuan Bio, Assistant Researcher & Postdoc at China Pharmaceutical University. Developed AI-driven screening libraries for CHO cell engineering, cutting screening cycles by 50%.
- **Zhang Yuming (Formulation Lead)** : PhD in Regenerative Medicine & Biopharmaceutical Engineering from the University of Toronto. His work on templated collagen sheets for cardiovascular repair is in a global “me-only” R&D tier, potentially the first to reverse heart failure.
- **Liu Xiaodong (Fermentation/Purification Lead)** : PhD in Neurobiology from Jinan University. Participated in multiple NSFC projects on CRISPR/Cas9 in large animal models and stem cell exosomes.
- **Zhang Zhenzhong (Pharmacology/Toxicology Lead)** : MS in Pharmacology from Shandong First Medical University. Former Project Manager at Pharmaron, managed preclinical IND submissions for 50+ global clients.

c. Existing Assets and Intellectual Property

1. **Core IP & Trade Secrets** : The company’s core value lies in its proprietary “mammalian cell expression system” and related process know-how.
 - **Recombinant Collagen Library** : A library of 7 types of recombinant human collagen and 2 types of ECM matrix proteins.

- **Proprietary Expression System** : High-performance CHO-GS- and HEK293 cell lines, the key to high-activity expression.
 - **High-Yield Process** : Mastered a stable, scalable production process at 2g/L, overcoming the industry's "low yield, high cost" bottleneck.
2. **Biological Assets** : A GMP-compliant three-tiered cell bank system (PCB, MCB, WCB) ensures production stability.
3. **Patents & Certificates** :
- Completed DMF registration for Type II/III recombinant human collagen (Nos. M2025423-000, etc.).
 - Cosmetic ingredient filing completed (Code: 003417-15123-5748).
 - Patent application "A Recombinant Human Type II Collagen and its Preparation Method and Application" (No. 2025115938018) has passed preliminary examination.

Section 4: Technical Feasibility and Product Pipeline

a. Raw Material Process Development

1. **Quality Standard & Research Process** : From reference standard purchase to quality research (physicochemical properties, molecular structure, function, impurities) and final test protocol establishment.
2. **Recombinant Collagen R&D Process** : A complete workflow from plasmid construction, transfection, clone screening (in 10L bioreactors), cell banking, to small/medium-scale process development and stability studies.
3. **Raw Material Development Plan** :
 - **Type II Collagen** : For medical devices, 30kg annual capacity, avg. price RMB 1.5M/kg.
 - **Type III Collagen** : For cosmetics/medical devices, 90kg annual capacity, avg. price RMB 1.0M/kg.
 - **Quality Verification** : Peptide map coverage for Type II is 100%; for Type III, it is 99.6%.

b. Formulation Production Design

The mammalian cell culture production line is divided into four main zones: inoculation (C-grade), fermentation (D-grade), crude purification (C-grade), and fine purification (C-grade). The new facility will support the production of raw liquids and formulations like fillers, eye drops, and sprays.

c. Product Pipeline

Category	No.	Product
Cosmetics	1.1	Recombinant Human Collagen for Sensitive Skin
Cosmetics	1.2	Recombinant Human Collagen for Infants
Class II Medical Device	2.1	Recombinant Full-Human Type III Collagen Repair Dressing
Class II Medical Device	2.2	Recombinant Full-Human Type III Collagen Infant Repair Dressing
Class II Medical Device	2.3	Recombinant Full-Human Type III Collagen Nasal Allergy Repair Spray

Category	No.	Product
Class II Medical Device	2.4	Recombinant Full-Human Type III Collagen Vaginal Thermosensitive Gel
Class III Medical Device	3.1	Recombinant Full-Human Type III Collagen Filler Gel
Class III Medical Device	3.2	Recombinant Full-Human Type II Collagen Cartilage Repair Gel
Class III Medical Device	3.3	Recombinant Full-Human Type III/IV Collagen Endometrial Repair Fiber
Excipient	4.1	Bioartificial Liver
Excipient	4.2	Cell Therapy Hydrogel Carrier

d. Product Technical Specifications and Competitive Benchmarking

(Detailed product descriptions, market sizes, and sales forecasts for each of the 7 key products are provided, highlighting CollaRegen’ s advantages in safety, efficacy, and market positioning.)

Chapter 2: Business Model

Section 1: Strategic Elevation: The Perfect Closed Loop of Serious Medicine and Consumer Medicine

This capital increase is not merely a financial investment by Beijing Triprime Gene Pharmaceutical Co., Ltd. (Triprime Gene) in an external project; it is a strategic maneuver to break through its own growth ceiling in the post-volume-based procurement era and fundamentally reshape its capital market valuation logic.

The core lies in constructing a synergistic closed loop between **serious medicine (Yundesu)** and **consumer medicine (CollaRegen’ s collagen products)** :

- **Serious Medicine as the Foundation** : Yundesu, with its robust clinical data and hospital channel advantages, establishes the company’ s credibility and scientific authority in the field of regenerative medicine.
- **Consumer Medicine as the Engine** : CollaRegen’ s high-margin, self-pay products (aesthetic injectables, premium skincare, Class II/III medical devices) provide explosive revenue growth and cash flow, breaking free from Medicare price controls.

This “stable base in Medicare, incremental expansion outside Medicare” model creates a perfect hedge against policy risks and unlocks a new dimension for the company’ s development.

Section 2: Breaking the “Medicare Dependency Syndrome”

Triprime Gene’ s flagship product, Yundesu, while successful, is inevitably constrained by the downward pressure of national volume-based procurement on drug prices. Its future growth faces a bottleneck.

CollaRegen’ s business model offers a powerful solution:

- **Market** : All target markets (aesthetics, efficacious skincare, gynecological repair, hair health) are **self-pay consumer markets** , completely insulated from Medicare reimbursement policies.
- **Pricing Power** : As a premium biomaterial, recombinant collagen enjoys strong pricing power. For example, raw material prices can reach RMB 11.5 million/kg, and finished aesthetic products command even higher margins.
- **Growth Driver** : This provides Triprime Gene with a high-growth, high-margin second curve that is independent of government procurement, effectively breaking the “Medicare dependency syndrome” .

Section 3: Market Value Management: Reshaping the Valuation System

The ultimate goal of this investment is to drive a fundamental re-rating of Triprime Gene in the capital markets, transforming its identity from a traditional biopharmaceutical company to a leading synthetic biology platform company. This is achieved through a “triple rocket” strategy:

- **Rocket 1 (EPS Driver)** : By consolidating CollaRegen’ s high-growth, high-margin earnings into its financial statements, Triprime Gene can directly and significantly boost its Earnings Per Share (EPS), providing solid fundamental support for its stock price.
- **Rocket 2 (PE Driver)** : The market will re-categorize Triprime Gene. Instead of being valued as a traditional pharma stock (typical PE ratio of 2030x), it will be valued as a “synthetic biology + aesthetics/consumer healthcare” platform (typical PE ratio of 4060x or higher), leading to a substantial multiple expansion.
- **Rocket 3 (Concept Driver)** : The integration of cutting-edge concepts like AI-assisted protein design, mammalian cell synthetic biology, and regenerative medicine platform will attract long-term capital focused on technological innovation, further enhancing its market premium.

Section 4: Integrated “R&D, Production, and Sales” Model

CollaRegen has built a highly efficient, vertically integrated value chain that covers the entire process from upstream raw materials to downstream finished products, ensuring quality control, cost efficiency, and rapid iteration.

- **R&D Integration** : Leveraging Triprime Gene’ s mature gene-engineered drug R&D platform (e.g., cell line development, screening technologies) to accelerate CollaRegen’ s pipeline.
- **Production Integration** : Utilizing the existing GMP-compliant facilities at No. 1 Jinyuan Road for pilot production, with plans for future capacity expansion to achieve economies of scale in both raw material and formulation manufacturing.
- **Sales Integration** : Initially, leveraging the Yundesu brand’ s trust in the medical and maternal & infant channels to launch premium skincare products, creating a fast cash-flow channel to support the longer-cycle Class III medical device registrations.

Section 5: “Dual-Engine” Profit Model

The company’ s profit model is driven by two complementary engines that balance short-term cash flow with long-term value:

- **Engine 1: Raw Materials & Cosmetics (Short-Term Cash Cow)**

- **Products** : Recombinant human Type III collagen raw materials, “Zhen’ ai” (Cherish) series infant skincare, and premium functional cosmetics.
- **Strategy** : Rapidly capture market share in the high-growth efficacious skincare segment to generate stable, high-margin cash flow from day one. This cash flow funds the R&D and registration of high-barrier medical devices.
- **Engine 2: Class III Medical Devices (Long-Term Value Anchor)**
 - **Products** : Aesthetic injectable fillers and cartilage repair scaffolds.
 - **Strategy** : These products have extremely high technical and regulatory barriers, creating a long-term competitive moat. Once launched, they will become the primary source of revenue and profit, capturing a significant share of the trillion-yuan aesthetic and orthopedic markets, and anchoring the company’ s high-end market position.

Chapter 3: Investment Estimation and Fundraising

Section 1: Use of Proceeds from This Round of Capital Increase

a. Total Investment and Funding Sources

The total investment for the Development and Industrialization Project of Novel Collagen Products is **RMB 50 million**. The funding will be sourced as follows:

- **This Round of Equity Financing** : RMB 30.5 million
- **Self-Financing by the Company** : RMB 19.5 million

This RMB 30.5 million equity financing constitutes the company’ s initial round of external fundraising, with a pre-money valuation of RMB 80 million and a post-money valuation of **RMB 110.5 million** .

b. Summary of Fund Allocation

The RMB 30.5 million raised in this round will be allocated as per the following summary:

Table 3-1: Summary of Fund Allocation (Unit: RMB 10k)

Category	Amount	% of Total
Raw Material R&D & Registration	14,200	46.56%
Formulation R&D & Production Line Construction	12,800	41.97%
Working Capital	3,500	11.47%
Total	30,500	100.00%

c. Detailed Breakdown of Expenditure

The detailed use of the RMB 30.5 million is as follows:

Table 3-2: Detailed Breakdown of Expenditure (Unit: RMB 10k)

Item	Sub-item	Amount	Notes
I. Raw Material R&D & Registration		14,200	
	1. Type I/Type XVII Collagen R&D	6,000	Includes gene synthesis, cell line construction, small-scale expression
	2. DMF Registration for Type I/Type XVII	2,200	Fees for testing, documentation, and NMPA submission
	3. Stability & Quality Research	3,000	For all four collagen types (I, II, III, XVII)
	4. Raw Material Pilot Production (200L)	3,000	Consumables, media, purification resins
II. Formulation R&D & Production Line		12,800	
	1. Aesthetic Filler R&D	3,000	Formulation design, rheology testing, animal studies
	2. Cartilage Repair Gel R&D	2,500	Scaffold development, stem cell co-culture studies
	3. Gynecological/Hair Health Product R&D	1,500	Gel, fiber, spray formulation development
	4. 200L Pilot Production Line Construction	5,800	Equipment purchase, facility modification, validation
III. Working Capital		3,500	For daily operations, marketing, and talent recruitment
	Total	30,500	

Section 2: Financial Projections

a. Revenue and Cost Forecast

Based on the product launch schedule and market penetration assumptions, the company's financial projections for 2026-2030 are as follows:

Table 3-3: Revenue and Cost Forecast (Unit: RMB 10k)

Item	2026E	2027E	2028E	2029E	2030E
Revenue	6,910	28,750	218,750	625,000	1,162,500
Cost of Goods Sold (COGS)	2,073	8,625	65,625	187,500	348,750
Gross Profit	4,837	20,125	153,125	437,500	813,750
Gross Margin	70.0%	70.0%	70.0%	70.0%	70.0%
Operating Expenses	3,500	8,000	60,000	150,000	250,000
Net Profit Before Tax	1,337	12,125	93,125	287,500	563,750
Net Profit After Tax	1,136	10,306	79,156	244,375	479,188
Net Profit Margin	16.4%	35.8%	36.2%	39.1%	41.2%

Key Assumptions :

- **2026** : Revenue is driven entirely by the sale of Type III collagen raw materials (at RMB 1M/kg) and premium skincare. Selling just **22kg** of raw materials can achieve the projected revenue of RMB 69.1 million.
- **2027** : Launch of Class II medical devices (dressings, sprays) and initiation of Class III device clinical trials.
- **2028** : Commercial launch of the world' s first recombinant collagen cartilage repair scaffold (Class III).
- **2029-2030** : Full-scale commercialization of both the cartilage repair scaffold and the aesthetic filler, driving exponential revenue growth.

b. Profitability and Investment Returns

The project demonstrates exceptional profitability and return potential:

- **Internal Rate of Return (IRR)** : The post-tax IRR for this investment is approximately **29.8%** , far exceeding the industry benchmark of 12% for biopharmaceutical projects.
- **Payback Period** : The dynamic payback period is estimated at **3.2-3.5 years** . Given the investment is made in early 2026, the principal is expected to be fully recovered by mid-to-late 2029, shortly after the launch of the Class III medical devices.
- **Return on Investment (ROI)** : By 2030, the cumulative net profit attributable to this round of investment is projected to exceed **RMB 400 million** , representing an ROI of over **13x** .

Section 3: Uncertainty and Risk Analysis

a. Break-Even Point (BEP) Analysis

The project has a very low break-even threshold, indicating strong risk resilience.

Table 3-4: BEP Analysis for 2026

Item	Amount
Fixed Costs (Annual)	RMB 35,000,000
Contribution Margin Ratio	70%
Break-Even Revenue	RMB 50,000,000
Equivalent Raw Material Sales	~13 kg

This means that in its launch year (2026), the company only needs to achieve **60% capacity utilization** (or sell about 13kg of raw materials) to cover all its costs, providing a substantial safety margin.

b. Asset-Liability Structure

Post-investment, the company's asset-liability structure will be healthy and sustainable:

- **Debt-to-Asset Ratio** : Will remain below 20%, as the company relies primarily on equity financing.
- **Current Ratio** : Expected to be above 3.0, ensuring strong short-term solvency.
- **Equity Structure** : Hainan Triprime's entry as a strategic institutional investor significantly enhances the company's creditworthiness and ability to secure future bank loans or additional equity financing if needed.

c. Financial Impact of This Capital Increase

This capital increase will have a profoundly positive impact on the company's financial health:

- **Capital Base Strengthening** : Registered capital will increase from RMB 2.5 million to RMB 2.9766 million, with a substantial capital reserve, providing a solid foundation for future operations and expansion.
- **R&D Capability Boost** : The dedicated R&D funds will accelerate the completion of the full product pipeline, particularly the high-value Class III medical devices.
- **Credit Rating Improvement** : The backing of a listed company (Triprime Gene) and the injection of RMB 30.5 million in cash will significantly improve the company's profile with suppliers, partners, and regulators.

d. Sensitivity Analysis

A sensitivity analysis was conducted on the two most critical variables: **product selling price** and **sales volume** .

Table 3-5: Sensitivity Analysis of IRR (%)

Scenario	-20% Price	-10% Price	Base Case	+10% Price	+20% Price
-20% Volume	12.1%	15.8%	19.5%	23.2%	26.9%
-10% Volume	18.3%	22.0%	25.7%	29.4%	33.1%
Base Case	24.5%	28.2%	29.8%	33.5%	37.2%

Scenario	-20% Price	-10% Price	Base Case	+10% Price	+20% Price
+10% Volume	30.7%	34.4%	38.1%	41.8%	45.5%
+20% Volume	36.9%	40.6%	44.3%	48.0%	51.7%

Conclusion : Even under the most adverse scenario (-20% price and -20% volume), the project' s IRR remains at **12.1%** , which is still at the industry benchmark. This demonstrates the project' s robustness and low sensitivity to market fluctuations.

Chapter 4: Transaction Structure and Legal Risk Control

Section 1: Overview of Transaction Structure

This capital increase is structured as a **preferred equity investment** by Hainan Triprime Pharmaceutical Co., Ltd. ("Investor") into Beijing CollaRegen Biotechnology Co., Ltd. ("Target Company"). The key elements are as follows:

- **Investment Amount** : RMB 15.25 million
- **Equity Issued** : New shares issued by the Target Company
- **Pre-Money Valuation** : RMB 80 million
- **Post-Money Valuation** : RMB 110.5 million
- **Equity Stake Acquired** : 21.0407% (calculated as $15.25 / (80 + 15.25)$)
- **Capital Structure Post-Investment** :
 - RMB 0.476563 million recorded as registered capital
 - RMB 14.773437 million recorded as capital reserve

The transaction is governed by a **Share Subscription Agreement** (Appendix 7), which incorporates comprehensive investor protection clauses aligned with international venture capital standards.

Section 2: Conditions Precedent to Fund Disbursement

To protect the Investor' s interests, fund disbursement is contingent upon the fulfillment of strict conditions precedent:

1. **Completion of DMF Registration** : The Target Company must obtain NMPA Medical Device Master File (DMF) registration certificates for recombinant human Type II and Type III collagen proteins **prior to or concurrently with** the closing date.
2. **Intellectual Property Confirmation** : All core IP related to the mammalian cell expression platform must be legally owned by or exclusively licensed to the Target Company, with no encumbrances.
3. **Corporate Governance Setup** : The Target Company must amend its Articles of Association to reflect the Investor' s board seat and veto rights before fund transfer.

Failure to meet these conditions within 10 business days of signing grants the Investor an unconditional right to terminate the agreement and receive a full refund of any deposited funds.

Section 3: Valuation Adjustment Mechanisms

a. Anti-Dilution Protection Based on Future Financing

The Investor is granted **full-ratchet anti-dilution protection** for the next 24 months. If the Target Company conducts a subsequent equity financing at a pre-money valuation **lower than RMB 110.5 million**, the Investor's equity stake will be adjusted upward to reflect the lower valuation, ensuring its economic position is not diluted.

Example: If a future round occurs at a RMB 55.25 million post-money valuation (half of current), the Investor's stake would effectively double to ~42%.

b. Milestone-Based Earn-Out (R&D Milestone Bet)

A performance-based earn-out mechanism is embedded to align management incentives with R&D progress:

- **Milestone**: Completion of DMF registration for recombinant human **Type I and Type XVII** collagen raw materials by **June 30, 2026**.
- **Consequence of Miss**: If the milestone is not achieved, the Investor may elect to:
 1. Receive additional equity to restore the original ownership percentage as if the missed milestone had reduced the company's valuation by 20%; or
 2. Convert its preferred shares into a debt instrument with a 6% annual interest rate, repayable from future cash flows.

This "R&D bet" ensures capital is tied directly to technical execution capability.

Section 4: Corporate Governance and Control Rights

To ensure strategic alignment and capital safety, the Investor secures significant governance rights:

- **Board Representation**: One (1) seat on the Board of Directors.
- **Veto Rights**: Unanimous consent required for the following matters:
 - Any change in business scope or core technology platform
 - Annual budget approval and major capital expenditures (>RMB 5 million)
 - Issuance of new equity or debt instruments
 - Related-party transactions
 - Appointment or removal of CFO or CTO
- **Information Rights**: Monthly financial reports, quarterly operational updates, and immediate disclosure of material adverse events.

These provisions grant the Investor **de facto control over strategic and financial decisions**, despite holding a minority stake.

Section 5: Exit and Liquidation Protections

a. Liquidation Preference

In the event of a liquidation, dissolution, or deemed liquidation event (e.g., merger, sale of >50% assets), the Investor holds a **1x non-participating liquidation preference**. This means it recovers **100% of its invested capital (RMB 15.25 million)** before any distribution to common shareholders (founders).

b. Exit Rights

- **Tag-Along Rights** : If founders sell their shares, the Investor may join the transaction on the same terms.
- **Drag-Along Rights** : If >75% of shareholders approve a sale, all shareholders must participate.
- **IPO Put Option** : If the company fails to file for IPO by December 31, 2029, the Investor may require the company or founders to repurchase its shares at fair market value plus 8% annual return.

These mechanisms ensure multiple, flexible exit pathways with downside protection.

Chapter 4: Risk Analysis and Mitigation Measures

a. Policy and Regulatory Risks

Risk : Changes in NMPA regulations could delay product approvals or reclassify products into higher-risk categories, increasing compliance costs.

Mitigation :

- Proactive engagement with regulators through pre-submission meetings.
- Diversification across multiple product categories (cosmetics, Class II, Class III) to avoid over-reliance on any single regulatory pathway.
- Leveraging the newly enacted *Regulations on Clinical Research and Translation of Novel Biomedical Technologies* (effective May 2026) to fast-track innovative devices like the cartilage scaffold.

b. Corporate Management Risks

Risk : As a newly founded company (established Sept 2025), CollaRegen lacks a proven track record in large-scale operations and commercialization.

Mitigation :

- Strategic integration with Triprime Gene's experienced management team for oversight in GMP, supply chain, and sales.
- Implementation of KPI-based compensation for executives tied to R&D milestones and revenue targets.
- Investor's board seat and veto rights provide real-time governance oversight.

c. R&D Risks

Risk : Technical failure in scaling up mammalian cell production or instability of the triple-helix structure during formulation.

Mitigation :

- The core technology has already been validated at pilot scale (2g/L yield confirmed).
- Redundant R&D paths: Both CHO and HEK293 platforms are being developed in parallel.

- Extensive stability and quality testing protocols are built into the development plan (RMB 30 million allocated to R&D & registration).

d. Market Competition Risks

Risk : Intensifying competition from established players (e.g., Jinbo Bio, Giant Biogene) could erode pricing power.

Mitigation :

- **Technological Moat :** Full-length, triple-helix structure via mammalian cells is a generational leap; competitors using microbial fermentation cannot replicate this.
- **First-Mover Advantage :** CollaRegen aims to be the first globally to launch a recombinant collagen-based **cartilage repair scaffold** (Class III), creating a defensible niche.
- **Brand Strategy :** Leveraging the trusted Yundesu brand for initial consumer product launches to build market credibility quickly.

e. Product Quality Control Risks

Risk : Batch-to-batch variability in biologics production could lead to recalls or regulatory sanctions.

Mitigation :

- Establishment of a full GMP-compliant three-tiered cell bank (PCB/MCB/WCB) ensures genetic stability.
- In-house QC lab with advanced analytics (HPLC, CD spectroscopy, rheometry) for real-time monitoring.
- All production processes are designed to be closed-system and automated to minimize human error.

Appendices

Appendix 1: Business License

(Scanned copy of Beijing CollaRegen Biotechnology Co., Ltd.' s Unified Social Credit Code Certificate)

Appendix 2: 2025 Financial Statements

- Balance Sheet (as of Dec 31, 2025)
- Income Statement (Q3Q4 2025)
- Cash Flow Statement

Appendix 3: Intangible Asset Valuation Report

Issued by Zhonglian Asset Appraisal Co., Ltd. (Report No.: ZLPG[2025]No.1287), valuing the recombinant collagen technology platform at RMB 62 million.

Appendix 4: Proof of Paid-in Registered Capital

Bank confirmation of RMB 2.5 million capital contribution by founding shareholders.

Appendix 5: Medical Device Master File (DMF) Registration Certificates

- M2025423: Recombinant Human Type II Collagen
- M2025428: Recombinant Human Type III Collagen (Version A)

- M2025429: Recombinant Human Type III Collagen (Version B)
- M2025431: Recombinant Human Type III Collagen (Cosmetic Grade)

Appendix 6: Cosmetic Ingredient Filing Certificates

- Notification Code: 003417-15123-5748 (Recombinant Human Collagen)

Appendix 7: Share Subscription Agreement

Full legal agreement between Hainan Triprime Pharmaceutical Co., Ltd. and Beijing CollaRegen Biotechnology Co., Ltd., including all schedules and exhibits.



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