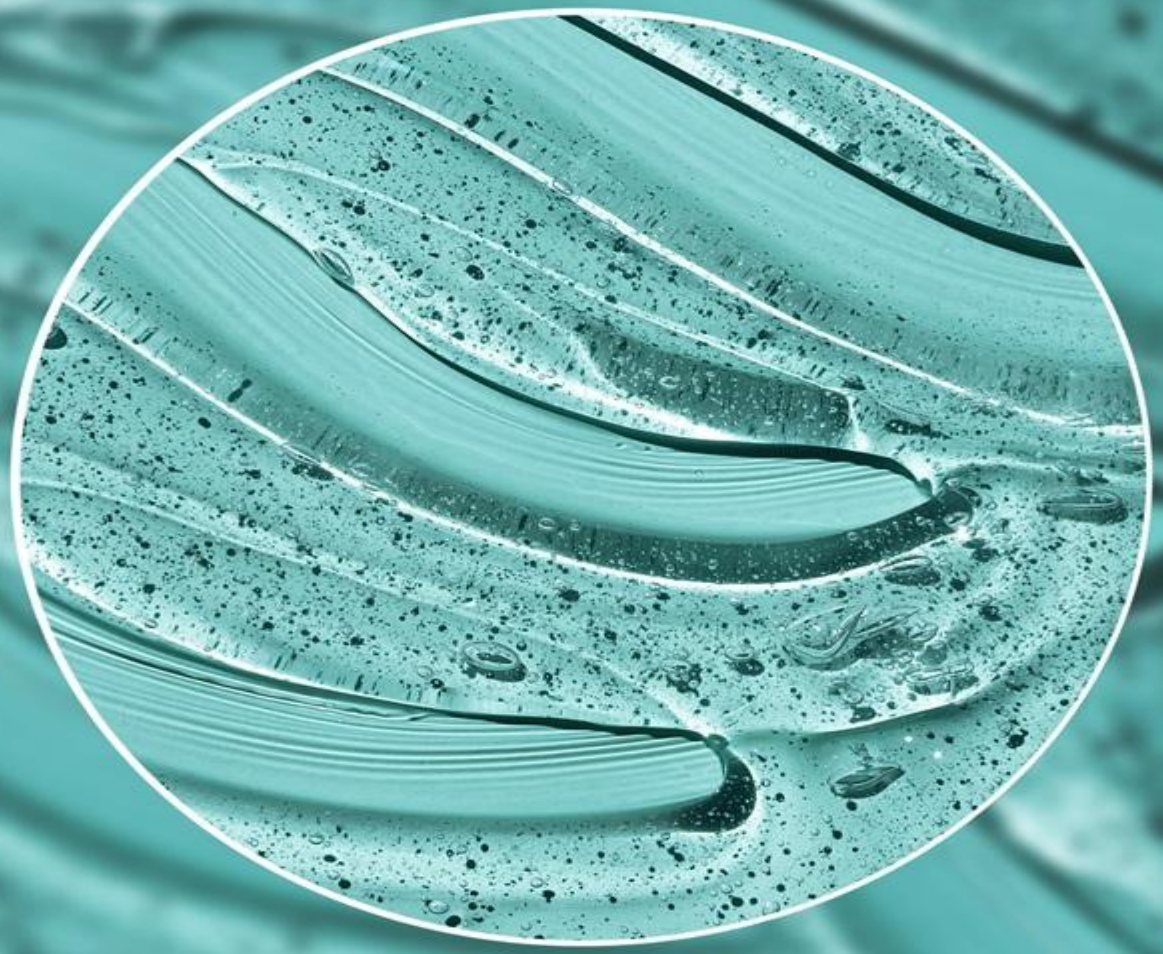


Worldwide Hyaluronic Acid Market Analysis

Apr 2025

Disclaimer and Scope of Analyzed Sources

This document represents estimates as of March 2024 is based on WINDOME BANKING PARTNERS SAS's intelligence leveraging a number of independent sources:

1/ The Mordor Intelligence Report on the Global Hyaluronic Acid Market (2018-2028), with information some on the number of fillers and aesthetic procedures, performance and market shares of key players for main regions and aesthetic country markets

2/ The Worldwide Market Report by GlobalData on the Aesthetics Market by Segment, country and competitors with market share indications (2015-2028)

3/ The Worldwide Market Report by GlobalData on the Aesthetics Dermal Fillers by type, country and competitors with market share indications (2015-2028)

4/ WINDOME BANKING PARTNERS SAS's presentation held at the IMCAS Webinar on Jan 27th, 2023 on the Challenges and Repercussions of COVID-19

5/ DRG QIV 2020 update including revised volume and value projections (2020-24) for HA and non-HA Dermal Filler and Toxin Injectables, Breast Implants and EBD segments and Dermocosmeceuticals, as well as by key regions

6/ Discussions with Leading Sector Executives, IMCAS Academy Webinars and Science Masterclass Teaching Courses, Business Insider Intelligence, Frost & Sullivan and KOLs or advisers of Regulatory Agencies ;

7/ The Clarivate "Global Rejuvenation: Aesthetics Market Analysis"; January 2024

8/ Updates based on information obtained as part of Mr. Coste's membership in the IMCAS Faculty (International Mastercourse of Anti-Ageing Science)

9/ Health Benefits of Glycosaminoglycans, Water-Binding Molecules That May Improve Skin and Help With Weight Loss By Lindsay Curtis

We cautiously advise our customers to make their own assessment as to the appropriate course of action to take, use this presentation as guidance. Please carefully consider local regulatory and guidance relevant for your area of operation, particularly the most recent advice issued by your local (and national) health authorities, before making any decision.

Glossary Of Selected Key Terminology

- **Mucopolysaccharide:)** Glycosaminoglycans (GAGs) or Mucopolysaccharides are long chains of sugar molecules that are found throughout the body, often in mucus and in fluid around the joints. They are more commonly called glycosaminoglycans.
- **Polysaccharides** long-chain carbohydrates made up of many monosaccharide (simple sugar) units linked together by glycosidic bonds.
    - Key points, They can be linear or branched, They are generally insoluble in water and not sweet-tasting, Used for energy storage (like starch and glycogen) or structural support (like cellulose and chitin).
- **D-glucuronic acid:** D-Glucuronic acid is a metabolite found in or produced by Escherichia coli (strain K12, MG1655)
- **N-acetylglucosamine:** N-Acetylglucosamine (GlcNAc) is an amide derivative of the monosaccharide glucose. It is a secondary amide between glucosamine and acetic acid.
- **UDP-glucuronic acid:** UDP-glucuronic acid is a sugar used in the creation of polysaccharides and is an intermediate in the biosynthesis of ascorbic acid (except in primates and guinea pigs). It also participates in the heme degradation process of human.
- **Uridine diphosphate N-acetylglucosamine:** Uridine diphosphate N-acetylglucosamine or UDP-GlcNAc is a nucleotide sugar and a coenzyme in metabolism. It is used by glycosyltransferases to transfer N-acetylglucosamine residues to substrates.
- **The biofermentation** process for synthesizing Hyaluronic Acid (HA) is a biotechnological method that uses microorganisms (usually genetically modified bacteria) to produce HA in a controlled and sustainable way.
    - **Overview of the Process:**
        - 1. Microorganism Selection
        - Traditionally: Streptococcus zooepidemicus (a natural HA producer)
        - Modern & safer: Genetically engineered E. coli or Bacillus subtilis (non-pathogenic)
        - These microbes are modified or selected to overexpress key enzymes that synthesize HA from sugar substrates.
    - **2. Fermentation**
        - The selected microorganism is cultured in a bioreactor with nutrients (like glucose, nitrogen sources, vitamins, minerals).
        - Under optimal conditions (pH, temperature, oxygen), the bacteria convert sugars into HA using their natural or engineered metabolic pathway

Hyaluronic Acid Production Process

- **Key Enzymes in HA Biosynthesis:**
- 1. **The main precursors are:**
    - UDP-glucuronic acid (UDP-GlcA)
    - UDP-N-acetylglucosamine (UDP-GlcNAc)
    - These are linked together by the enzyme hyaluronan synthase, which catalyzes the polymerization into HA.
- **2. Purification**
    - After fermentation, the broth contains HA along with bacterial cells and by-products.
    - Cell separation (filtration/centrifugation)
    - Enzymatic treatments (remove proteins/DNA)
    - Ultrafiltration to concentrate and purify HA, Drying (e.g., spray drying) to get HA powder
- 3. **Advantages of Biofermentation:**
    - Vegan-friendly (no animal origin)
    - Consistent molecular weight control
    - Scalable and sustainable
    - **High purity level** Lower contamination risk compared to animal extraction
    - Ability to comply with the most stringent requirements in purity levels (beyond the pharmacopoeia): Ions, Proteins, Nucleic acids, Bacterial endotoxins, heavy metal residue elimination
    - **Batch to batch consistency**

      Low variability with low polydispersity
- **High stability , R**esulting in long-lasting functionality in the end products.

Table of contents

Purpose of the Report and Methodology

- **Purpose**

This report aims to provide comprehensive insights into the global biopolymers market, especially in healthcare and aesthetics, assessing its current status, growth potential, and future trends. Hyaluronic acid (HA), a naturally occurring polysaccharide found in the human body, primarily in connective tissues, skin, and joints. It is known for its ability to retain water, making it a key ingredient in skincare, medical, and orthopedic applications The multifaceted applications of, ranging from medical products to beauty enhancers, have driven its market to evolve continuously, adapting to varying consumer needs and technological advancements.

The primary purpose of this study is to furnish stakeholders, including industry leaders, investors, and policymakers, with an in-depth analysis of the biopolymers market. It seeks to uncover the driving forces behind the market's expansion, understand the challenges and constraints faced by the sector, and identify the opportunities for future growth. By evaluating market dynamics, consumer behavior, and competitive strategies, the report intends to aid in strategic decision-making and offer forecasts that help in planning long-term growth strategies in the biopolymers industry.

- **Methodology**

The methodology of this report encompasses a combination of primary and secondary research to ensure comprehensive and accurate results. The approach is outlined as follows:

- **Secondary Research:** Initially, an extensive review of existing literature was conducted. This included analyzing industry reports, scholarly articles, company annual reports, and market analysis publications to gather historical data and understand the current trends. Secondary research helped in identifying the market segmentation and key players, forming a solid foundation for the report.
- **Primary Research:** Interviews were carried out with industry experts, including CEOs, marketing managers from leading collagen-producing firms and KOLs from the industry including: plastic surgeons, owner of medical beauty spas. Insights from these interactions provided a real-time understanding of market dynamics and expert opinions on future trends.
- **Quantitative and Qualitative Analysis:** Both quantitative data (market size, growth rates, and revenue forecasts) and qualitative insights (market trends, growth drivers, and challenges) were analyzed.
- **Market Forecasting:** Using time-series analysis, regression models, and market forecasting techniques, the report predicts future market trends. This section provides stakeholders with expected market developments and potential investment opportunities.

The methodology adopted in this study ensures that the report provides a holistic view of the global collagen market, supported by reliable data and expert opinions, facilitating strategic decision-making for stakeholders involved.

Executive Summary of Key Findings

Total HA market size 2024 & CAGR2024-2034

$11.8bn

6.0%

Total collagen market size 2023 & CAGR2023-2030

$11.8bn

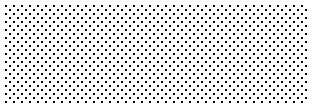
9.1%

Total Chitosan market size 2023 and CAGR 2023-2030

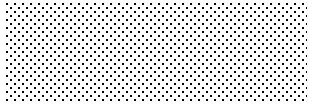
$90.5m

+7.8%

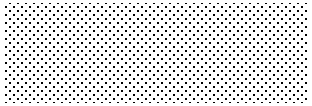
North America 2024 HA Market Revenue share



Asia Pacific 2024 HA Market Revenue share



Dermal filler(biggest application share)



Market segmentation

- The global Hyaluronic Acid market size is expected to reach **$19.9 billion** by 2034, with CAGR of **6.0%**
- The dermal fillers segment held the largest share (value) of the HA market (40%) in 2024

Geographical distribution

- North America (CAGR 6.1%) takes dominant share in 2024 market Revenue share of 44.1%, with the following of Market share of that of Asia Pacific (CAGR 8.9%)

Key opportunities

- Strong growth in minimally invasive cosmetic procedures using HA for facial volume restoration.
- Rising interest in vegan, fermentation-derived HA over animal-sourced alternatives.

Growing trend

- Shift away from animal-derived HA (from rooster combs) toward vegan, fermentation-derived HA produced by non-pathogenic bacteria.
- men's skincare lines are adopting HA for hydration and anti-aging

Source

- **Animal-Derived HA:** Primarily from rooster combs
- **Microbial Fermentation:** Produced by fermenting non-pathogenic bacterial strains (Bacillus subtilis, Lactococcus lactis, Streptococcus zooepidemicus)

Key Challenges

- **Downstream processing** (extraction, filtration, drying) contributes significantly to cost.
- Molecular Weight Sensitivity
- Requirement validation for biocompatibility, sterility, and stability.

Section I
Definition of Hyaluronic acid market

Hyaluronic Acid Classification

Hyaluronic acid raw material can be prepared by animal tissue extraction (originally cockscomb) or microbial fermentation. The molecular weight of hyaluronic acid obtained by animal tissue extraction generally ranges **from 200,000 Dalton to 2,000,000 Dalton**, while **microbial fermentation** can obtain hyaluronic acid with a molecular weight greater than 2,000,000 Dalton, and can also obtain hyaluronic acid with a molecular weight of less than 200,000 Dalton through later chemical degradation or microbial digestion techniques. **It is also possible to obtain hyaluronic acid with a molecular weight of less than 200,000 Dalton by subsequent chemical degradation** or microbial digestion. Hyaluronic acid can be categorized as large, medium, or small depending on the molecular weight range

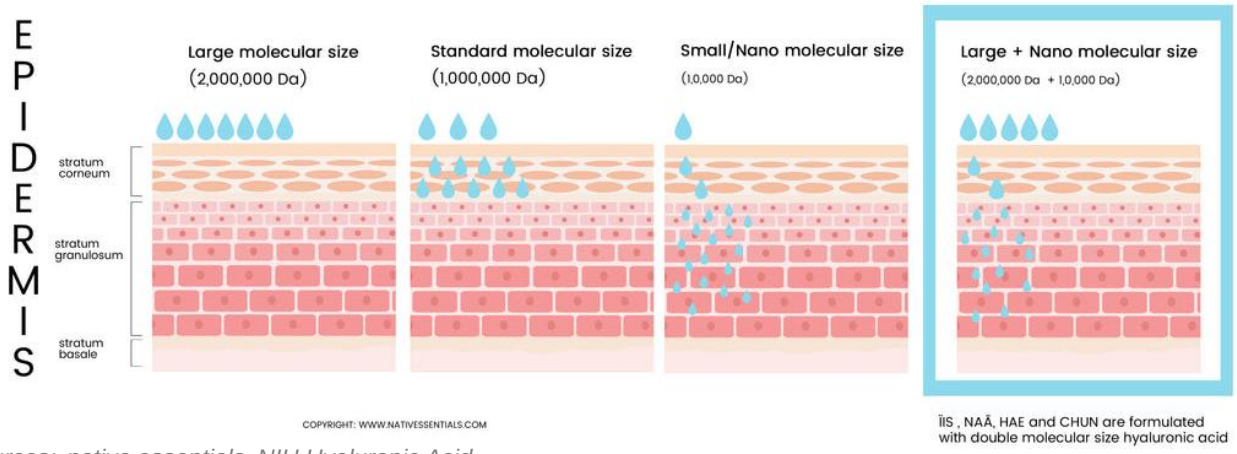
Large molecule hyaluronic acid, which typically has a molecular weight range of **1,800,000 to 2,200,000 Dalton**, is more viscous in aqueous solution and takes longer to metabolize in the body

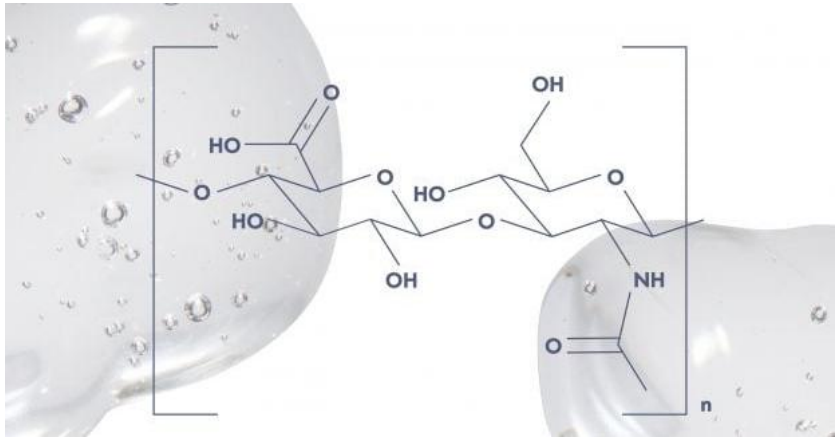
Medium molecular hyaluronic acid has a molecular weight between large and small molecules.

Small molecule hyaluronic acid is usually in the molecular weight range of **200,000~1,000,000 Dalton** and is metabolized more quickly in the body.

The difference in molecular weight makes hyaluronic acid show different physical and biological properties, with a wide range of applications. Hyaluronic acid with larger molecular weight has stronger support, resistance to degradation and viscoelasticity, so it is often used as a molding filler material in medical aesthetics. Smaller molecular weight hyaluronic acid is able to penetrate the epidermis and achieve deep skin absorption, so it is often used in moisturizing skin care products.

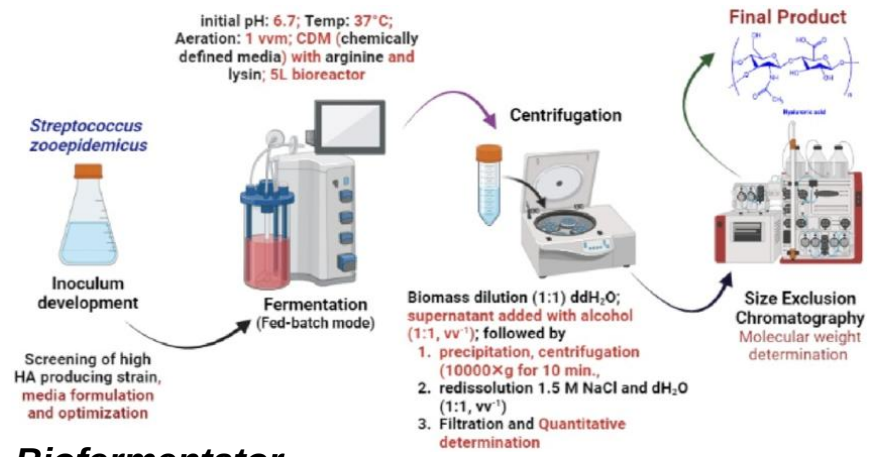
HYALURONIC ACID ABSORPTION





Sources: native essentials, NIH Hyaluronic Acid

Hyaluronic Acid Production uses - Biofermentation



Biofermentator

1. Strain Selection & Genetic Engineering (optional)

- *Use of Streptococcus zooepidemicus*
- *Or genetically engineered strains (e.g., Bacillus subtilis, E. coli, Zoo Equi) for better control and safety*

2. Fermentation

- *The bacteria are grown in a bioreactor, fed with nutrients:*
  - *Glucose (carbon source)*
  - *Peptones / yeast extract (nitrogen)*
  - *Salts, trace elements*
- *Under aerobic conditions and tightly controlled pH/temp*
- *Bacteria secrete HA into the culture medium*

3. Recovery

- *The culture broth is filtered to separate bacterial cells from the HA-rich supernatant*

4. Purification

- *Steps include:*
  - *Centrifugation*
  - *Precipitation (often with ethanol or isopropanol)*
  - *Dialysis or ultrafiltration to remove proteins, nucleic acids, endotoxins*
  - *Multiple Sterile filtration Passages*

5. Drying and Formulation

- *Purified HA is lyophilized (freeze-dried) into a powder*
- *Later rehydrated via pre-mixing with aqueous solutions for use in:*
  - *Dermal fillers*
  - *Eye drops*
  - *Joint injections*
  - *Skin creams*

Streptococcus zooepidemicus

✓ *The bacteria convert glucose into **UDP-glucuronic acid** and **UDP-N-acetylglucosamine***

✓ *These are polymerized by **hyaluronan synthase enzymes** → into high molecular weight*

Section II
The Global HA Market

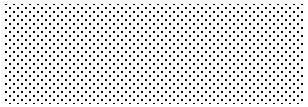
The Global HA Market reached $11.1bn in 2024 and is well-poised for breakout growth in the next years

HA market size 2024
$11.1bn

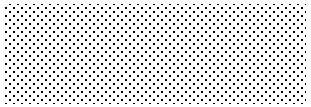
CAGR2024-2034
6.0%

HA market size 2034
$19.9bn

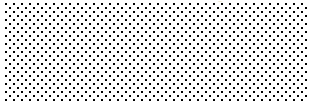
Dermal filler(biggest application share)



Asia Pacific 2024 Market Revenue share



North America 2024 Market Revenue share



- In terms of revenues, the **dermal filler product segment dominated the market with the biggest revenue share of** [redacted]**%** in 2024
- Hyaluronic Acid was first discovered 90 years ago, back in 1934, by Columbia University researchers Karl Meyer and John Palmer. They extracted the vitreous humor from the eyeballs of a cow and characterized it as a highly hygroscopic, high-molecular-weight polysaccharide acid. In the 1970s, scientists realized they could extract hyaluronic acid from the combs of roosters and its use became more popular. The companies that tended to extract and utilize it mostly had connections to the poultry or egg industries due to their easy access to roosters.
- **Hyaluronic acid (HA),** is a sulfur-free straight-chain mucopolysaccharide composed of the disaccharide units **D-glucuronic acid and N-acetylglucosamine**, which is widely distributed in connective tissues, epithelial tissues, and neural tissues of the human body. Its unique molecular structure and physicochemical properties in the body show a variety of important physiological functions, such as lubrication via viscosupplementation of joints to regulate the permeability of the blood vessel wall, regulating the diffusion of proteins and electrolytes and the maintenance of sufficient hydration, anti-inflammation and promote wound healing.while protecting the epidermal layers of the skin against external aggressions from free radicals ,exposure to ultraviolet rays and the consequences of oxidative stress. Particularly important is that the hyaluronic acid molecule can absorb up to 1000 times its weight in water, so it can be used as a high-quality moisturizing ingredient to reduce Transepidermal Water Loss (TEWL) with high clinical value, known as the natural moisturizing factor.
- **Key Characteristics:**
  - **Hydrophilic:** Can hold up to 1,000 times its weight in water.
  - **Biocompatible and biodegradable:** Safe for medical and cosmetic applications.
  - **Viscoelastic:** Acts as both a lubricant and a shock absorber in joints.

Notes: CAGR: Compound Annual Growth Rate / average growth rate per year.
Sources: precedenceresearch, Mordor Intelligence

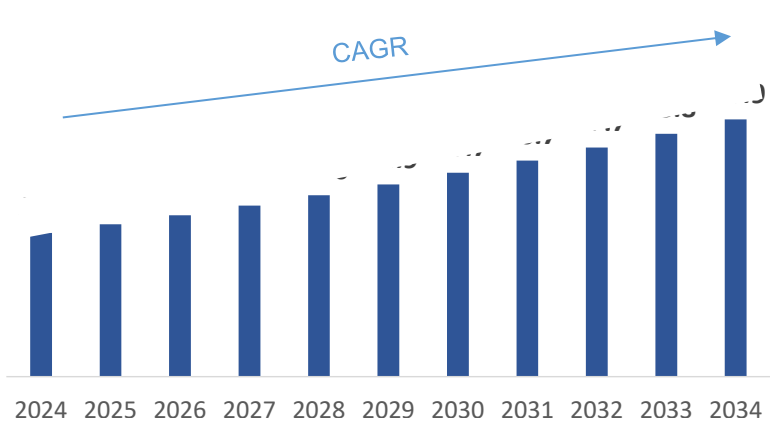
Global Hyaluronic Acid Market Growth & Trends

GLOBAL Hyaluronic Acid MARKET OVERVIEW

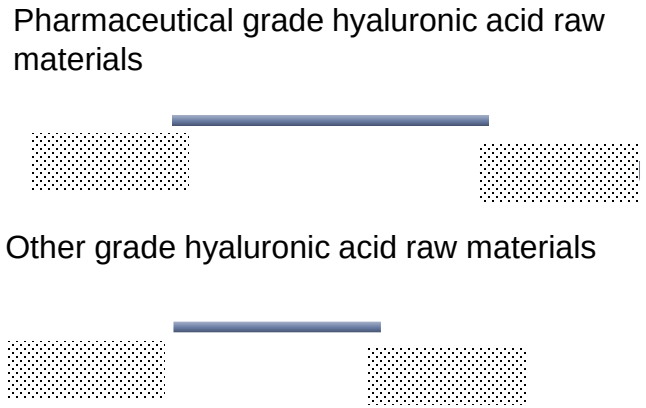
HIGH DEMAND FROM THE MEDICAL AESTHETICS DERMO-COSMETICS AND REGENERATIVE MEDICINE SECTORS ACCELERATES GLOBAL GROWTH

- The global Hyaluronic Acid market size is expected to reach **USD 19.9 billion by 2034**, expanding at a revenue-based **CAGR of 6.0 %** from 2024 to 2034, according to a report by Grand View Research (March 2025). The global Hyaluronic Acid volume sales is **1150.0 tons** in 2023, of which, pharmaceutical-grade hyaluronic acid raw materials sales is the fewest, but its unit price is much higher than other grades.
- Because of its hydrating and anti-aging characteristics, hyaluronic acid is frequently used in skincare products. It contributes to moisture retention, which keeps the skin hydrated and plump. Hyaluronic acid has become more and more in demand in cosmetics and personal care items, including serums, lotions, and moisturizers. As a result, new products have entered the hyaluronic acid market, further accelerating its expansion. Furthermore, the aging population and the frequency of joint problems are driving the need for hyaluronic acid in the healthcare industry.
- The market for natural and organic skincare products is expanding as people become more aware of the components in the goods they use. Because hyaluronic acid is a naturally occurring substance in the body, it fits nicely with this trend and will continue to develop in the hyaluronic acid market.

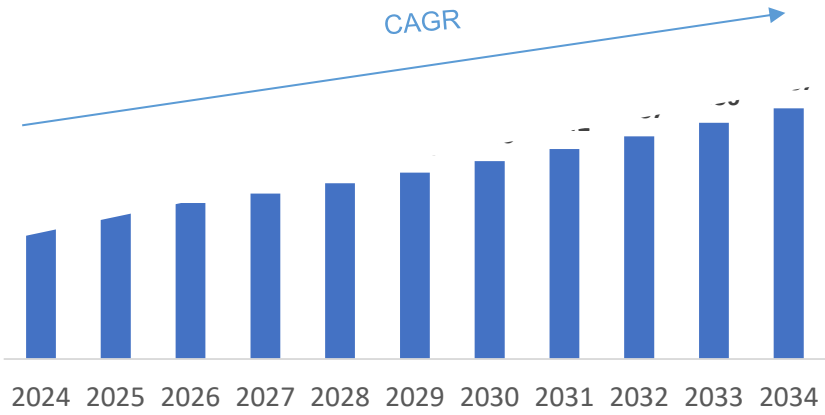
Global Hyaluronic Acid Market Size Evolution
Revenue in USD billions, 2024-2034



Hyaluronic acid raw material price(2024)
(Based on Frost & Sullivan)



US HA market Size (2024)
Revenue in USD billions, 2024-2034



Sources: Grand View Research, Huatai Research

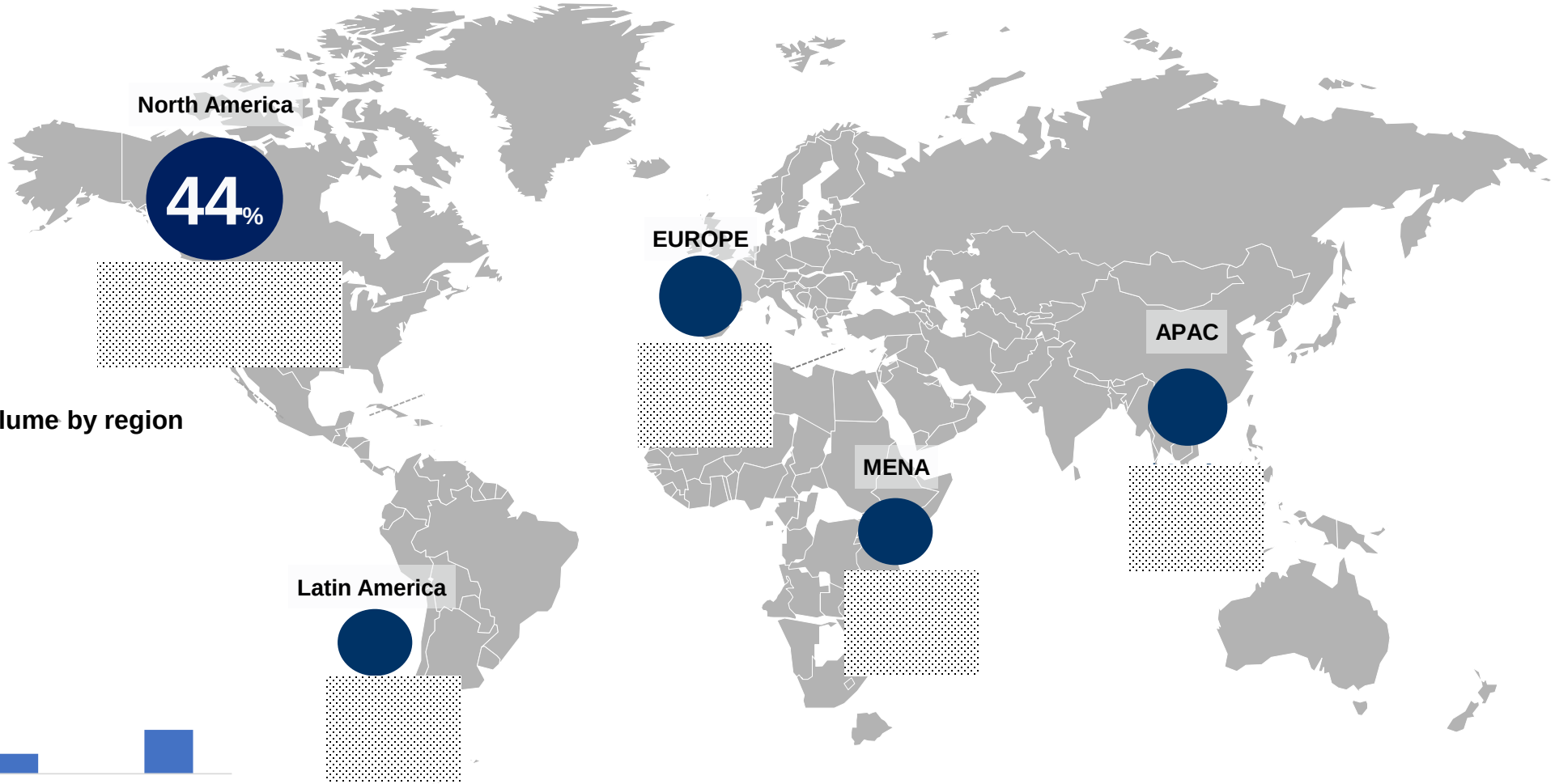
Global Hyaluronic Acid Supply Evolution from 2024

Global Production f Hyaluronic Acid

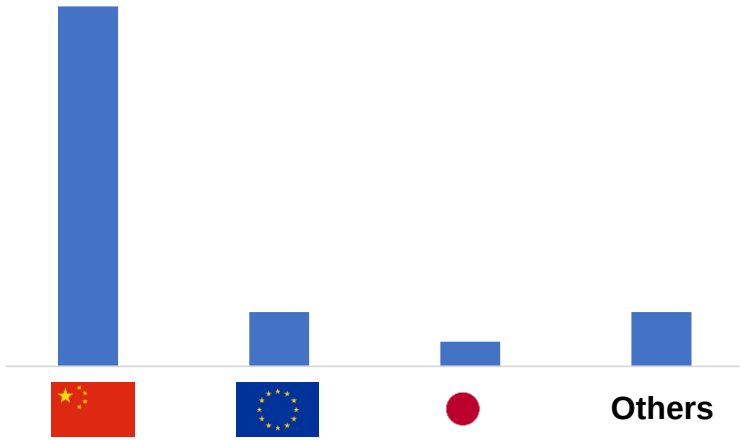
$11.1bn in 2024

$19.9bn in 2034

+6.0% CAGR 2024-2034



Hyaluronic acid Ingredient volume by region

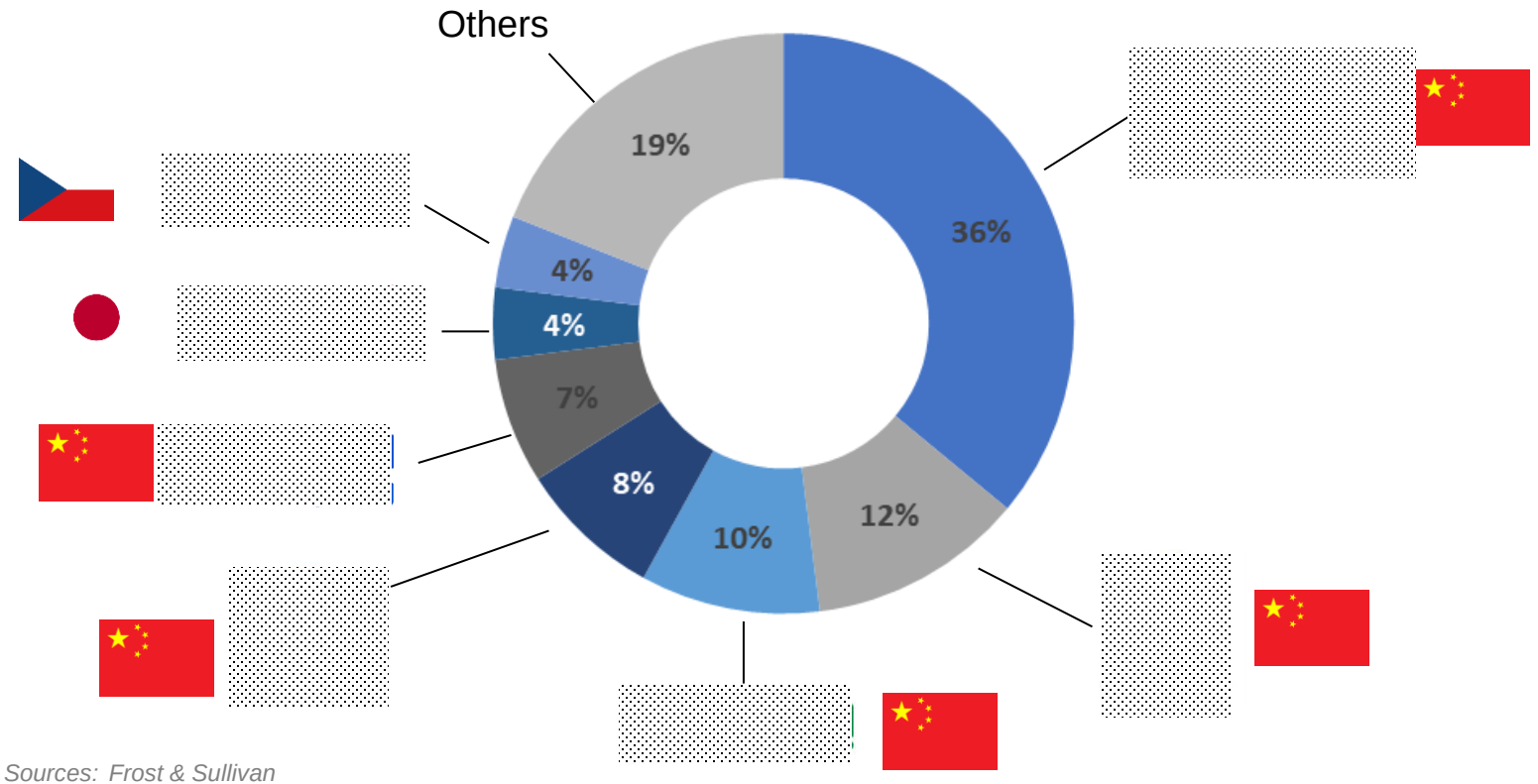


Sources: Global newswire, Mordor Intelligence

Global Hyaluronic Acid Ingredients Market Competitive Landscape

Hyaluronic acid Ingredient volume led by Chinese company, of which volume accounted for 86%

China is the world's largest hyaluronic acid raw materials production and sales country, the total sales volume of hyaluronic acid raw materials in China in 2023 accounted for [redacted] of the global total sales volume of the world's top five hyaluronic acid raw materials sales volume of the top five companies, all of which are Chinese companies. Among them, [redacted] **is the world's largest hyaluronic acid production and sales enterprise, accounting for [redacted] of the sales volume in 2023.**



Global Hyaluronic Acid Ingredients

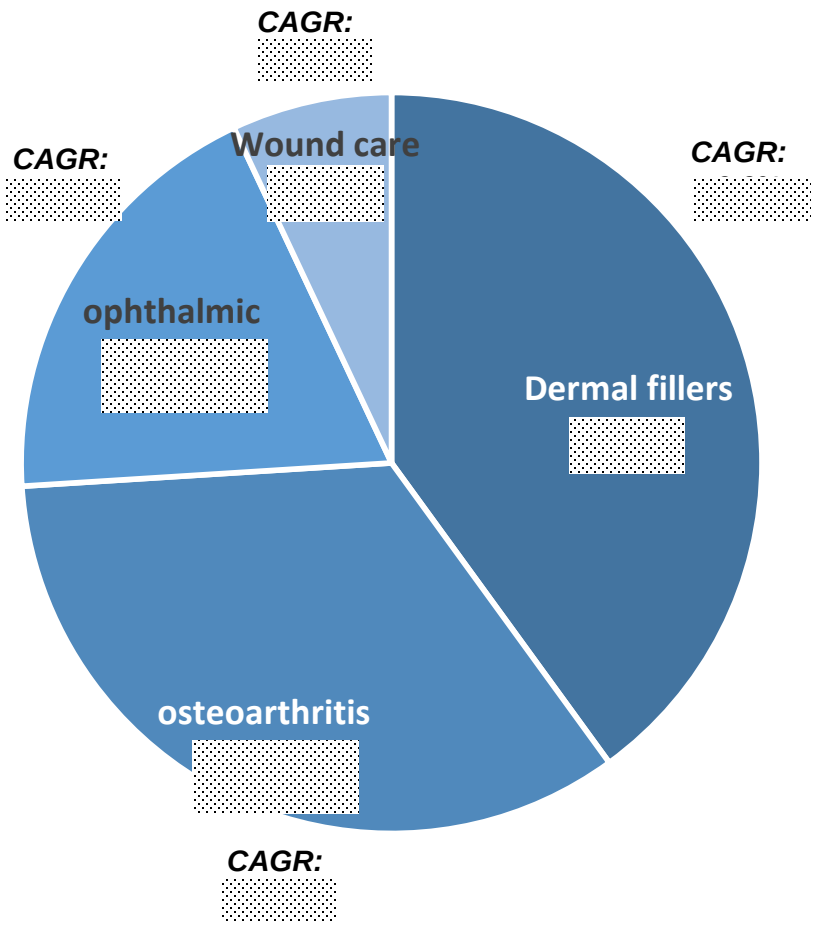
[redacted]

Sources: Frost & Sullivan

Breakdown of Application of Hyaluronic Acid

The dermal fillers segment held the largest share of the hyaluronic acid market in 2024

Application of Hyaluronic Acid






- **Hyaluronic acid-containing dermal fillers** have been in high demand due to a number of variables, including an aging population, rising public awareness of cosmetic procedures, and developments in aesthetic medicine, exposure to inflammatory agents such as oxidative stress, pollution and endocrinological disruptors, global warming, ultraviolet sunrays following depletion of ozone layers. Customers are looking for more natural-looking outcomes that accentuate their features without coming across as excessive.
- Hyaluronic acid is the material of choice for dermal fillers since it is a naturally occurring component in the body and is generally well-tolerated. These filters are renowned for their ability to produce outcomes that look natural with little chance of problems or negative responses. Hyaluronic acid-based fillers have witnessed constant innovation in the hyaluronic acid market, including changes in formulation, cross-linking strategies, and delivery systems. The fillers now perform and last longer because of these advances. The quest for minor changes and faster recovery times has fueled a growing trend towards less invasive cosmetic procedures, such as dermal fillers.
- **The osteoarthritis segment is expected to witness the fastest growth in the hyaluronic acid market** by application. In the medical field, hyaluronic acid is also utilized, especially in the treatment of osteoarthritis. It is injected into the joints to act as a cushion and lubricant, decreasing discomfort and increasing joint range of motion. New uses for hyaluronic acid are being investigated through ongoing research and development. In order to increase the effectiveness of hyaluronic acid-based medicines, manufacturers are concentrating on creating cutting-edge formulations and delivery methods.

Sources: Grand View Research

HA's Characterization, Mode of Delivery and Main Applications

Category	Mode of Delivery	Main Applications
Pharmaceutical Grade	Injectable Transparent Hyaluronic Acid	lubricant or shock absorber to treat osteoarthritis pain
		lubricant to prevent post-surgical adhesions
		viscous adhesive for ophthalmic surgery
		plastic surgery filler to prevent skin aging
	Eye Drop Transparent Hyaluronic Acid	carrier for ophthalmic drugs to reduce drug irritation and prolong drug efficacy
Cosmetic Grade	Topical Transparent Hyaluronic Acid	Used in various moisturizing skincare products
Food Grade	Food-Grade Transparent Hyaluronic Acid	nutritional supplements and food products

Notes: CAGR: Compound Annual Growth Rate / average growth rate per year.
Sources: precedenceresearch, Mordor Intelligence

Section III
The Global HA Policies Overview

National policies on Hyaluronic Acid

United States Food and Drug Administration (FDA) Labeled Indications

Intraarticular injection
For pain relief in patients with mild to moderate osteoarthritis (OA) of the knees, who have not responded to conservative non-pharmacological measures and/or analgesics. The FDA has not evaluated nor approved this treatment for any other joints.

Intradermal injection
Injection into the mid-to-deep dermis for correction of facial wrinkles or folds and perioral rhytids. Patients must be over the age of 21.

Subcutaneous injection
Volume deficit correction for dorsal hands in patients over the age of 21. Correction of age-related volume loss and for cheek augmentation in mid-face in patients over the age of 21.

Subperiosteal injection
Correction of age-related volume loss and for cheek augmentation in mid-face in patients over the age of 21.

Submucosal injection
Correction of age-related volume loss and for cheek augmentation in mid-face in patients over the age of 21.

Topical cream/gel
Management of wounds, skin ulcers, Relief of symptoms (burning, itching, and pain) in dermatoses such as atopic dermatitis, radiodermatitis, and allergic contact dermatitis.

Ophthalmic
Surgical aid cataract extraction, intraocular lens implantation, corneal transplant, glaucoma filtration, retinal attachment surgery, and anterior segment surgery.

Non-FDA-Labeled Indications

•Injection to provide a scaffold for regenerative endodontic procedures, Injection into vocal folds to treat glottal insufficiency, Injection into the areola to enhance nipple projection after breast reconstructive surgery, Refractory interstitial cystitis

Sources: native essentials, NIH Hyaluronic Acid

Section IV
Selected Company of Hyaluronic acid

WINDOME

BANKING PARTNERS

PARIS, SAN FRANCISCO

JEAN-YVES COSTE
CO-FOUNDER, CHAIRMAN AND PARTNER

JYCOSTE@WINDOME-BANKING.COM
+33 6 21 82 95 48

FLORIAN PUCHLY
CO-FOUNDER, CEO AND PARTNER

FPUCHLY@WINDOME-BANKING.COM
+33 699392010

ZHONGSHI CONG
SENIOR ASSOCIATE

ZCONG@WINDOME-BANKING.COM
+33 6 68 28 57 02