

GLOBAL STEM CELL THERAPEUTICS COMPANY

KANGSTEM BIOTECH



Company Overview

Name	Kangstem Biotech Co., Ltd.
Founder	Kyung-Sun Kang DVM, Ph.D. Professor, Seoul National University
CEO	Jongcheon Na Pharmacist, Ph.D
Business Area	Stem Cell Therapy R&D
Employee	109 Ph.D : 11 / MS : 25 / Others : 73
Capital	7 Million USD
Founded	10 / 29 / 2010
IPO	12 / 21 / 2015 (Listed on KOSDAQ)

Headquarter

512, Teheran-ro, Gangnam-gu, Seoul



Global R&D Center

84, Gasan digital 1-ro, Geumcheon-gu, Seoul

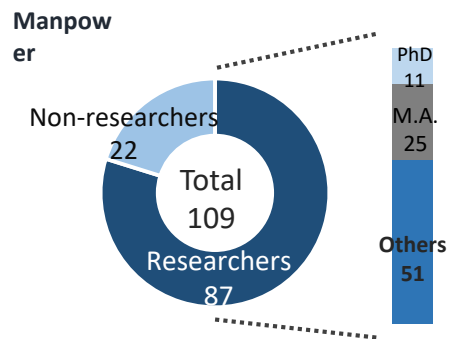


Stem Cell GMP Center

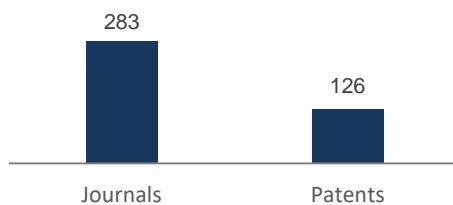
6F, SK TechnoPark, Gwangmyeong-si, Gyeonggi-do



Research and Development Capabilities



Journals & Patents



Manufacturing and Production Capabilities

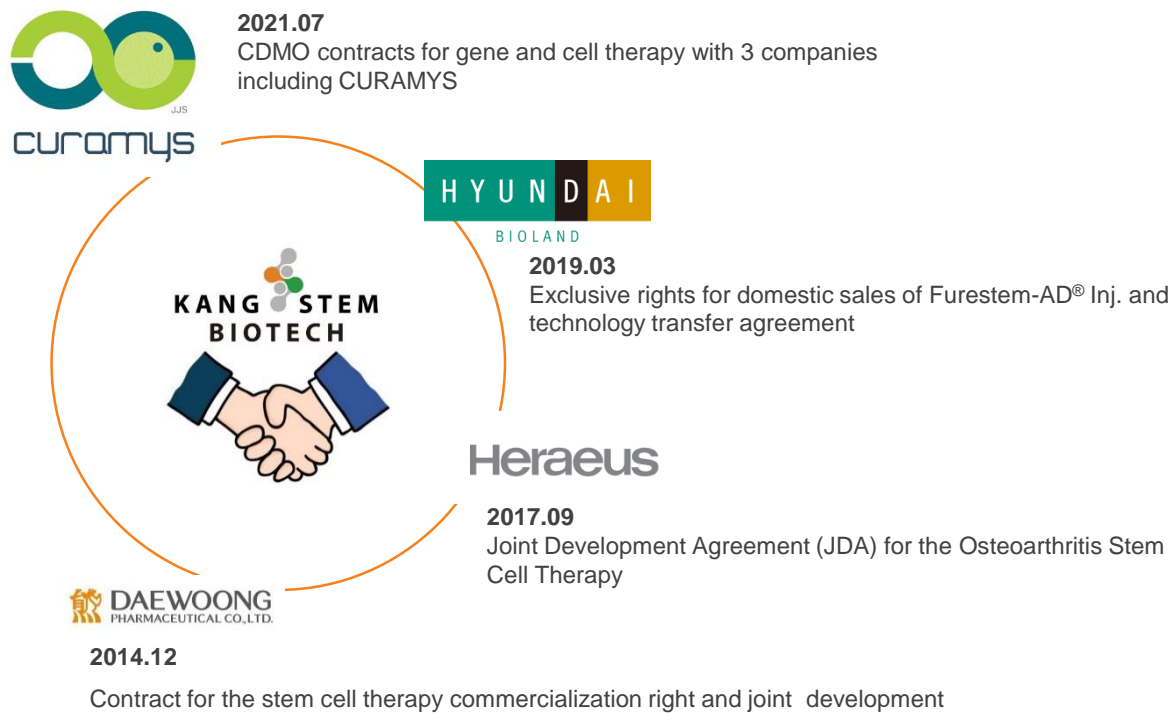
Construction Date	May 2019
Size	2,600m ² (~ 28,000 ft ²)
Investment	USD 16Million
Production	36,000 vials/yr

- Complying with PIC/S, c-GMP, EU-GMP, KGMP regulations
- Acquired Manufacturing License for advanced biopharmaceuticals (Dec. 2020)
- Acquired License for Human Cell Management (Jul. 2021)

■ KSB Pipeline

Product	Target	Nation	Pre-Clinical	Clinical Trial			BLA	Note
				Phase I	Phase II	Phase III		
Furestem-AD® Inj.	Atopic Dermatitis	KOR	→			Expected in 2023	<ul style="list-style-type: none"> 2019 Domestic Exclusive Sales and Tech. Transfer Agreement with Hyundai Bioland Phase 3 (named FURIN) in progress 	
Furestem-OA Kit Inj.	Osteoarthritis	KOR	→				<ul style="list-style-type: none"> 2017 Joint Development Agreement with Heraeus Medical in Germany Completed submission of Phase1 IND 	
Furestem-RA® Inj.	Rheumatoid Arthritis	KOR	→				<ul style="list-style-type: none"> 2014 Sales Right and Joint Development Agreement (JDA) with Daewoong Pharmaceutical Completion of Phase 1/2a trial 	

■ Major Contracts

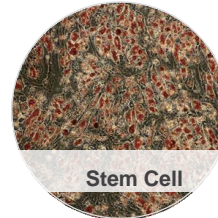


■ Business for Stem Cell Therapy

I Furestem®

Our product name FURESTEM comes from the combination of the words “Full”, “Recovery”, and “Stem cells”. It delivers Kangstem Biotech’s vision to overcome the limitations of current therapeutics and accomplish to be the fundamental cure for the patients with rare and incurable diseases.

Furestem
®



Furestem-AD® Inj.

Atopic dermatitis

Phase IIb / IND : 2016.07

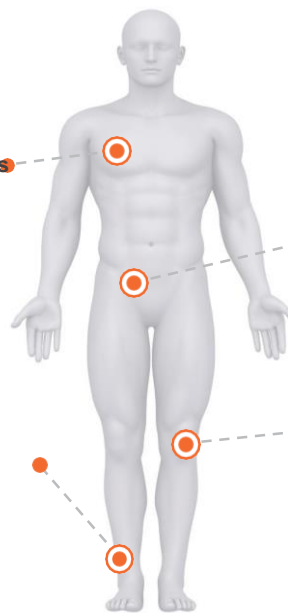
Phase III / IND : 2021.05

Furestem-RA® Inj.

Rheumatoid arthritis

Phase I / IND : 2014.05

Phase I/IIa / IND : 2018.02



Crohn's disease, Psoriasis

Furestem-CD® Inj.

Phase I / IIa / IND : 2013.06

(Chron's disease)

Phase I / IND : 2014.12 (Psoriasis)

Furestem-OA Kit Inj

Osteoarthritis

Phase I / IND : 2022. 3Q

(Exp.)

I Immune Commander

WHY

Why doesn't the mother recognize the fetus as a foreign object?

Why doesn't immunorejection occur and doesn't the immune system attack itself when UCB stem cells are transplanted?



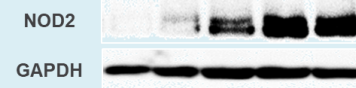
NOD2

A recognition receptor that detects the danger of the immune system and informs my body of the danger.

High level of NOD2 in umbilical cord blood stem cells

High Level of **NOD2**

Bone Marrow Umbilical Cord Blood



Source: Internal Test Results

→ High level of NOD2 in umbilical cord blood stem cells compared to bone marrow stem cells



✓ Pharmaceutical Composition Comprising Stem Cells Treated with NOD2 Agonist or Culture Thereof for Prevention and Treatment of Immune Disorders and Inflammatory Diseases (Registration: KR, JP, US, CN, EU)

✓ Kim et al. Gastroenterology, 2013 (IF: 16.7)

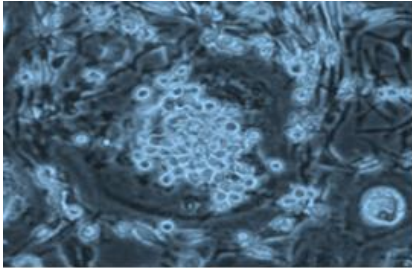


Research Papers

High-compact Technology Strategy for Stem Cell: SELAF™

SELAF™

One-stop platform optimized for stem cells from the procedures of separation and production to clinical trials



Selected Cell



Large Scale



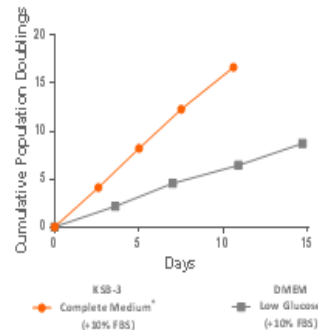
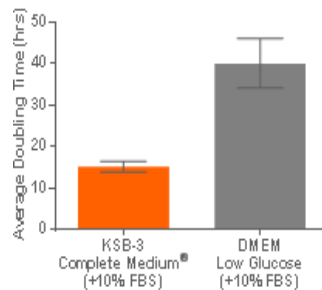
Freezing Technology

SELAF™_Selected Cell

Immune-specific stem cells with high NOD2, the immune commander in the body

SELAF™_Large Scale : Stem Cell Culture Media

Maintain high proliferation and stable cell quality when cultivated through self-developed culture medium (KSB-3 Complete Medium® Kit)



KSB-3 Complete Medium® Kit increased proliferation of undifferentiated stem cell compared to DMEM

SELAF™_Freezing Technology : CryoSupport® and Purple Vie®

Cell freezing (CryoSupport®) and thawing (Purple Vie®) platform to extend shelf life and optimize quality.



■ First-in-class, Stem Cell Therapy for Atopic Dermatitis

I Furestem-AD[®] Inj

We have completed the Phase 1/2a clinical trials of FURESTEM-AD[®] Inj. in 2015. It was confirmed that the EASI-50 score (typical index of severity in AD) was significantly decreased by 55% after treatment.



- Evaluation of the safety and efficacy of FURESTEM-AD[®] Inj. for the patients with moderate-to-severe Atopic Dermatitis (AD)
- Clinical Trial Period : 12 weeks
- Number of Subjects : 32 people
 - ✓ Phase1 : 6 subjects/ Phase 2a : 26 subjects

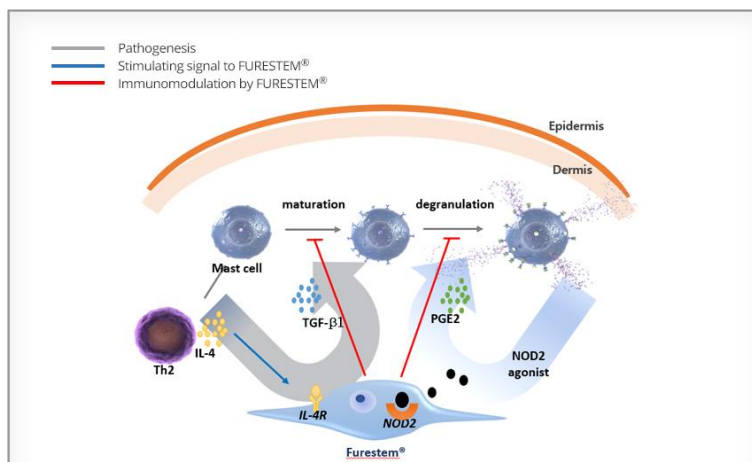
Dose-dependent effectiveness

Division	Number of Cells	Number of Patients	Percent decrease of EASI-50 score (Average)
High-dose group	50,000,000 (5.0x10 ⁷ cells)	12	55%
Low-dose group	25,000,000 (2.5x10 ⁷ cells)	14	36%

- Verified significant decrease in AD related scoring index for both doses
- Significant decrease was observed in high-dose group (5.0x10⁷ cells) compared to the low-dose group
- Confirmed dose-dependent effect

Kim et al. Stem Cells (2016)

I MoA : Furestem-AD[®] Inj.



- IL-4 is secreted from Th2 cells. FURESTEM-AD[®] Inj. is stimulated by IL-4. Stimulated FURESTEM-AD[®] Inj. secretes TGF-β1. TGF-β1 suppresses expression of FcεR1 receptor (during maturation of mast cells). FURESTEM-AD[®] Inj. secretes PGE2. PGE2 suppresses degranulation of mast cells. FURESTEM-AD[®] Inj. inhibits each step of mast cell activation and degranulation through the secretion of TGF-β1 & PGE2.

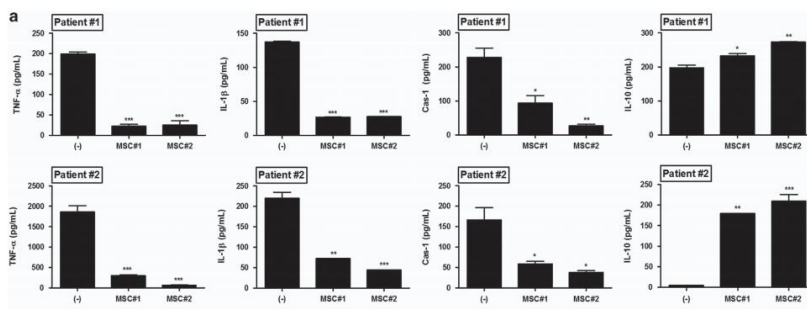
I Stem cell Therapy of Canine Atopic Dermatitis

Pre-Clinical Research in Progress

Best-in-class, Stem cell Therapy for Rheumatoid Arthritis

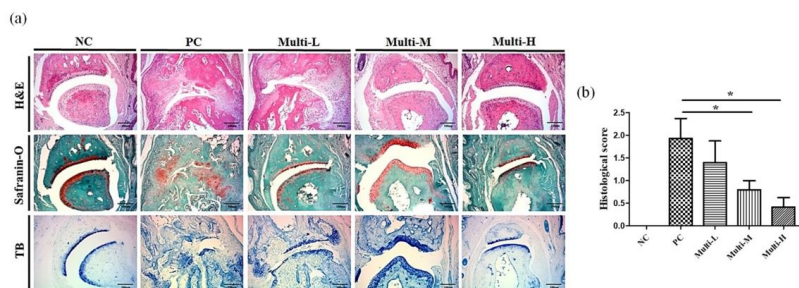
Furestem-RA[®] Inj.

Furestem-RA[®] Inj. treats moderate to severe rheumatoid arthritis through IV injection. In phase 1 clinical trial for single dose, safety and therapeutic potency was confirmed. To optimize the injection dosage, phase 1/2a was completed in 03/2022 and the results are under review.



Shin et al. Cell death and disease, 2016

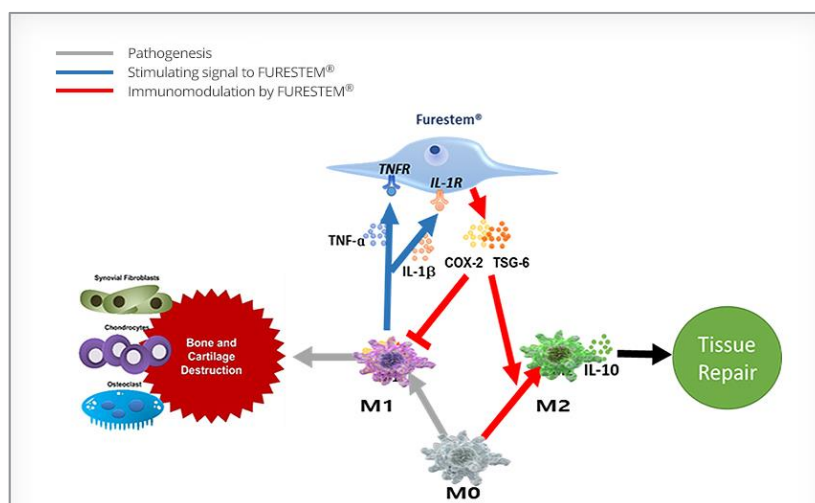
- Peripheral blood mononuclear cells (PBMCs) of RA patients were co-cultured with Furestem-RA[®] Inj. to measure the secretion of inflammatory cytokines and anti-inflammatory cytokines. As a result, the secretion of inflammatory cytokines TNF-α, IL-1β, and Cas-1 was inhibited by Furestem-RA[®] Inj. and the secretion of IL10, an anti-inflammatory cytokine, was promoted.



Yu et al. J Tissue Eng Regen Med, 2019

- As a result of repeated IV administration at 2-week interval for three times, pannus formation was decreased, articular cartilage erosion and histological scores were improved in the middle-dose and high-dose group.

MoA : Furestem-RA[®] Inj.



- FURESTEM-RA[®] Inj. suppresses the activation of M1-type macrophage which induces inflammation, and induces generation of M2-type macrophage via TNF-α-mediated activation of cyclooxygenase-2 (COX-2) and TNF-stimulated gene-6 (TSG-6). M2 macrophage suppresses inflammatory symptoms and contribute to regeneration of damaged tissues.

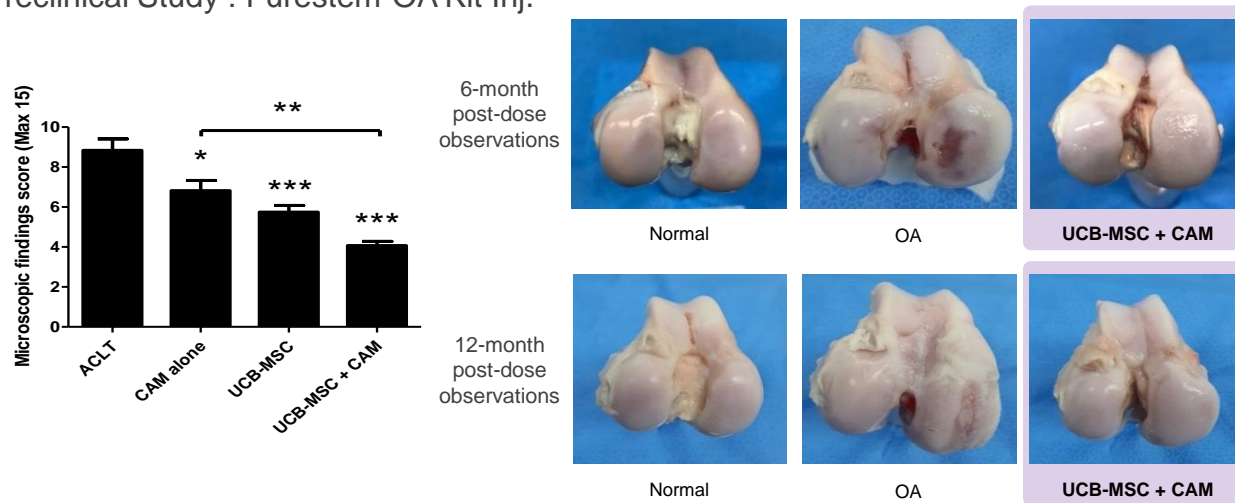
Kim et al. Gastroenterology (2013)

■ A New Concept of Stem Cell Therapy for Osteoarthritis

■ Furestem-OA Kit Inj.

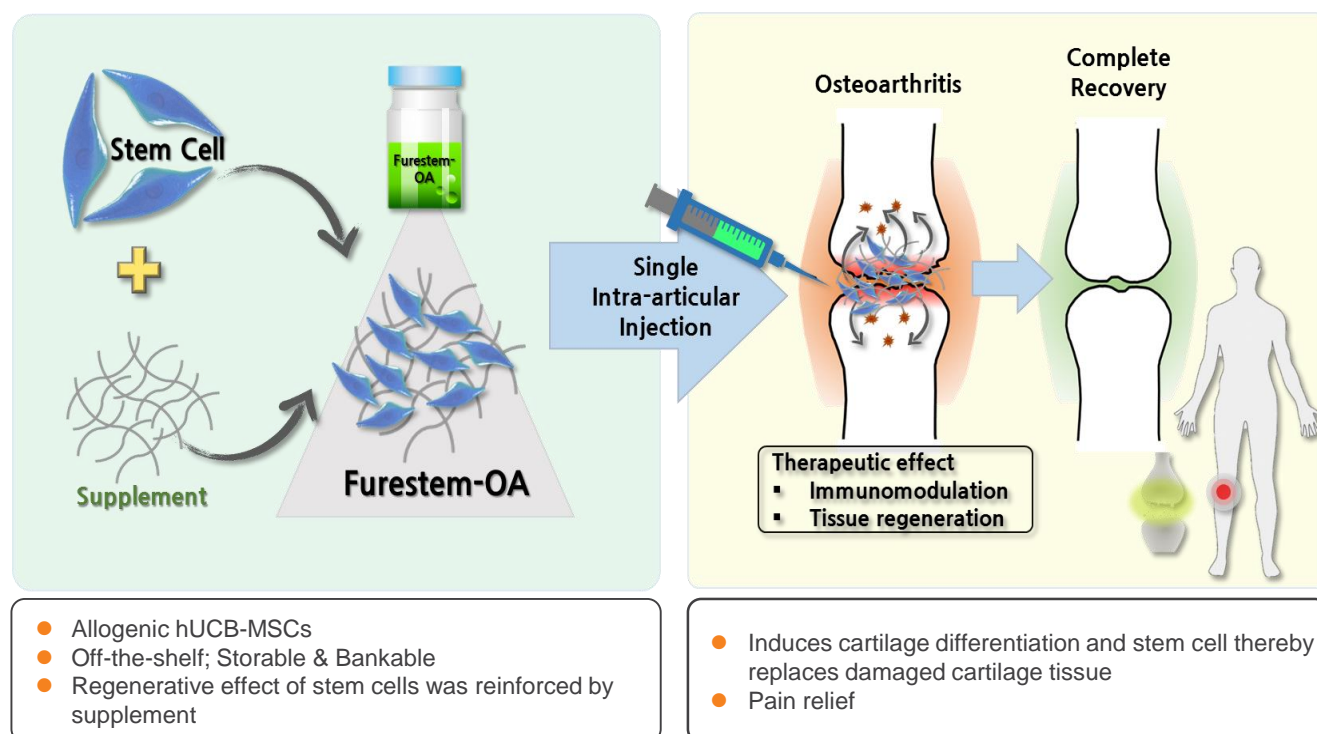
KSB is developing an OA therapeutic product which can cure the disease by one intra-articular injection without the need of surgery. Furestem-OA Kit Inj. shows therapeutic effect as two main pathway; regeneration and immunomodulation. The supplement in Furestem-OA Kit Inj. accelerates cartilage differentiation and ECM production of injected stem cells, which results effective regeneration of damaged cartilage tissue comparing with other stem cell therapies. Phase 1 clinical trial in Korea is expected to be initiated in 2022

■ Preclinical Study : Furestem-OA Kit Inj.



Combined administration of hUCB-MSCs and CAM (Furestem-OA Kit Inj.) group among all test groups had the best improvement on arthritis by suppressing degenerative changes and cartilage damage of the joint.

■ Developmental Strategy : Furestem-OA Kit Inj.

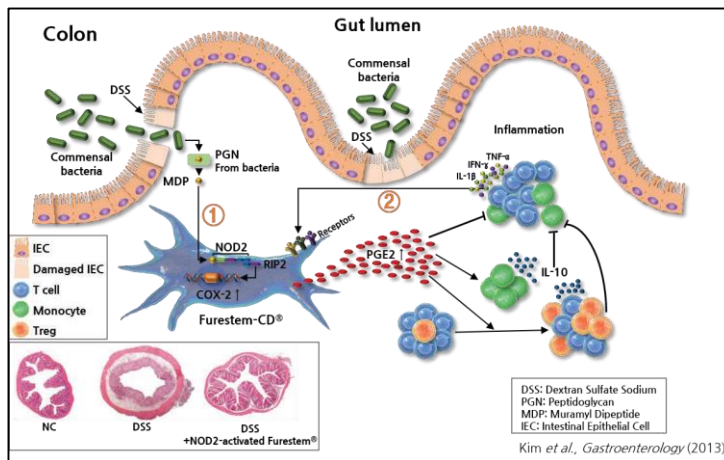


■ Indication Expansion of Stem Cell Therapy in Immunological Disorders

┆ Furestem-CD® Inj.

To completely cure Crohn's Disease(CD) and fulfill the unmet needs, KSB is processing the clinical trials of Furestem-CD® Inj., based on our published mechanism of actions for fundamental treatments and full recovery instead of just relieving the symptoms

┆ MoA : Furestem-CD® Inj.



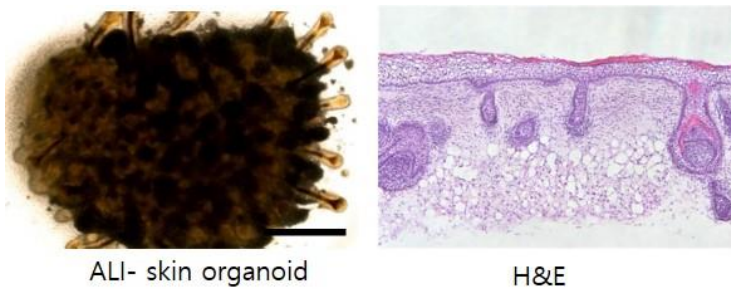
- hUCB-MSCs regulates PGE2 to activate regulatory T-cells, suppressing Th1 and Th17 cells, accelerating tissue regeneration and reducing inflammatory responses.

■ Next Generation Stem Cell Therapy

┆ Organoid

KSB is developing organoid technologies. Through these technology, KSB will be able to provide skin, blood vessel, islet and brain organoids for disease modeling, drug screening and moreover tissue replacement.

┆ Skin Organoid

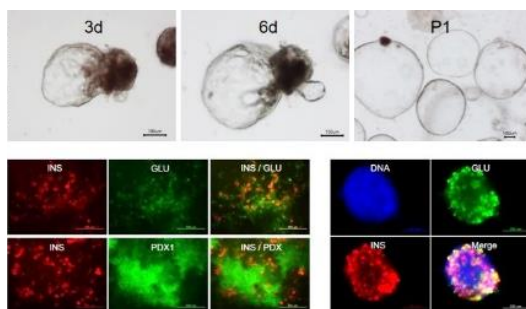


ALI- skin organoid

H&E

- Completion of structures similar to the real skin
- Hair follicles and hair growth
- Platform of atopic dermatitis treatment
- Development of skin replacement
- Targeting commercialization in 2023

┆ Islet Organoid

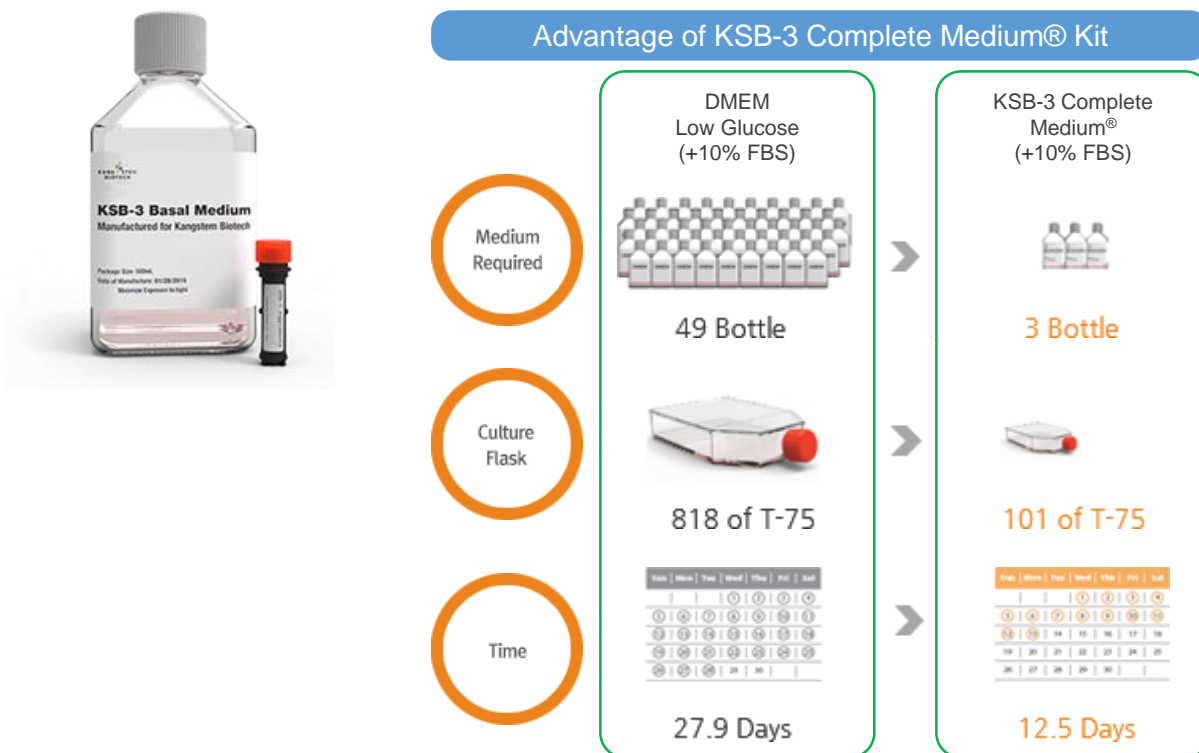


- Fundamental treatment of diabetes
- Cellular components similar to human islets
- Functional islet organoid that secrete insulin in respond to glucose

■ Mesenchymal Stem cell Culture Medium

▮ KSB-3 Complete Medium® Kit.

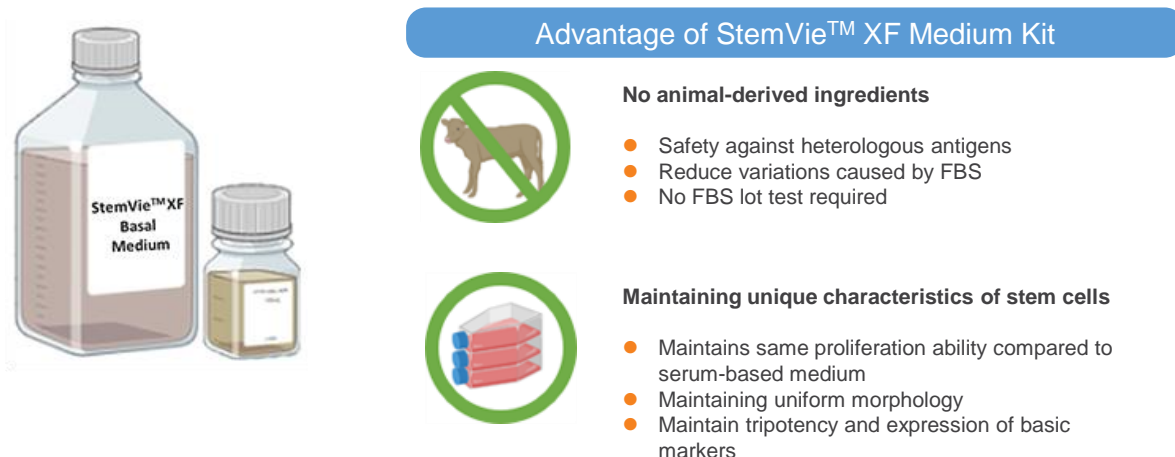
The stem cell conditioned medium (KSB-3 Complete Medium® Kit) is a medium for culturing the human mesenchymal stem cell, which can enhance the proliferation of stem cells in a state of non conversion, high proliferation ability, and uniform cell status



KSB-3 Complete Medium enables scale-up of human adipose tissue-derived MSCs from 10^6 to 10^9 cells using 93.9% less medium, 55.2% less time, and 87.7% fewer culture flasks compared to DMEM.

▮ StemVie™ XF Medium Kit.


KSB developed serum-free stem cell culture medium (StemVie™ XF Medium Kit), which is a serum-free medium for culturing human mesenchymal stem cells. It can provide high proliferative capacity and uniform cell status during culture.




Cell Freezing and Thawing Platform

CryoSupport


CryoSupport is a platform for Cell Freezing and Thawing.




CS-25AT




CS-25AM




CS-64CT



CS-4FR




CS-4M




CS-4T

Advantage of CryoSupport




Shortened Working Time by 8min 45sec

- No need to move vials from CRF rack to cell boxes
(Based on 500vials)



Prevention to Increase Vial Temperature

- During the working time (8 min 45 sec), there is no significant difference in the temperature
 - ✓ Only about 4 °C increased from -76°C of initial temperature to -72 °C




Increase the Stability of Stacking

- Possible to assemble bottom of cell box body and top of cell box lid

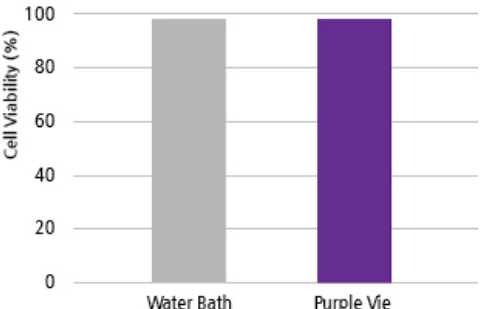
Purple Vie® Thawer

Innovative Dry Thawing System



Performance Data of Purple Vie® Thawer

Water bath vs Purple vie
(UCB-MS, CryoStor 10)



Condition	Cell Viability (%)
Water Bath	100
Purple Vie	100

Thawing Time
(Initial Temperature: -80°C)
(AT-Closed vial 2.0mL, CryoStor 10)

1.0mL	Approx 3min
1.5mL	Approx 3min 30sec
2.0mL	Approx 4min

- Dry Thawing (Water-free)
- Non-Contact
- AT-Closed vial only
- Reproducibility
- User friendly
- Traceability
- Portable (140 x 190 x 217(mm))



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