"はかる"技術で未来を創る
東陽テクニカ

Confidential

AGM-1000
Cell Encapsulation Reagent Kit



TOYO Corporation
One Technologies Company

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Development department for in-house products

Innovative Company Accelerating Research with Cutting-Edge Technology

AGM™ Microorganism Encapsulation Reagent Kits MCM-3 released in 2023

AGM™ Animal Cell Encapsulation Reagent Kit AGM-1000 released in 2024

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AGM™ (Agarose gel microcapsules) Basic Technology

AGM™ reagent encapsulates single microorganisms within an agarose gel/shell structure, enabling cultivation (DNA amplification) in an aqueous environment. This method promotes the reduction of bias components and enables genome coverage of 90% or more, and will be available for sale in 2023.



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Article | Open Access | Published: 18 October 2022

Agarose gel microcapsules enable easy-to-prepare, picolitre-scale, single-cell genomics, yielding high-coverage genome sequences

Hiroyoshi Aoki, Yuki Masahiro, Michiru Shimizu, Yuichi Hongoh, Moriya Ohkuma & Yutaka Yamagata

Scientific Reports **12**, Article number: 17014 (2022) | Cite this article

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Abstract

Introduction

(https://doi.org/10.1038/s41598-022-20923-z)



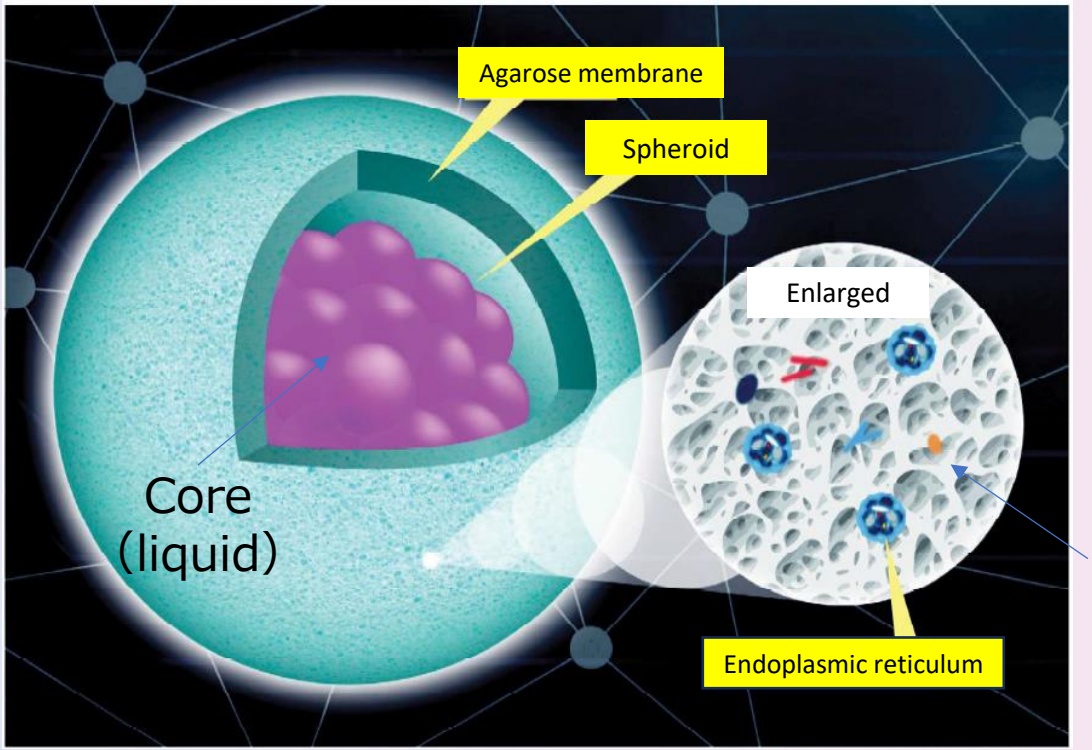
AGM™ reagent kit for microorganisms is provided based on RIKEN's patented technology (Patent No. 7018685).

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Characteristics of AGM (agarose capsule) The porous structure of 30~200nm

- Rapid exchange of media & gases
- High permeability for enzymes/reagents
- Efflux of Extracellular metabolite
- Protective effect by capsule

Embedded animal cells in AGM and applied to 3D culture capsule



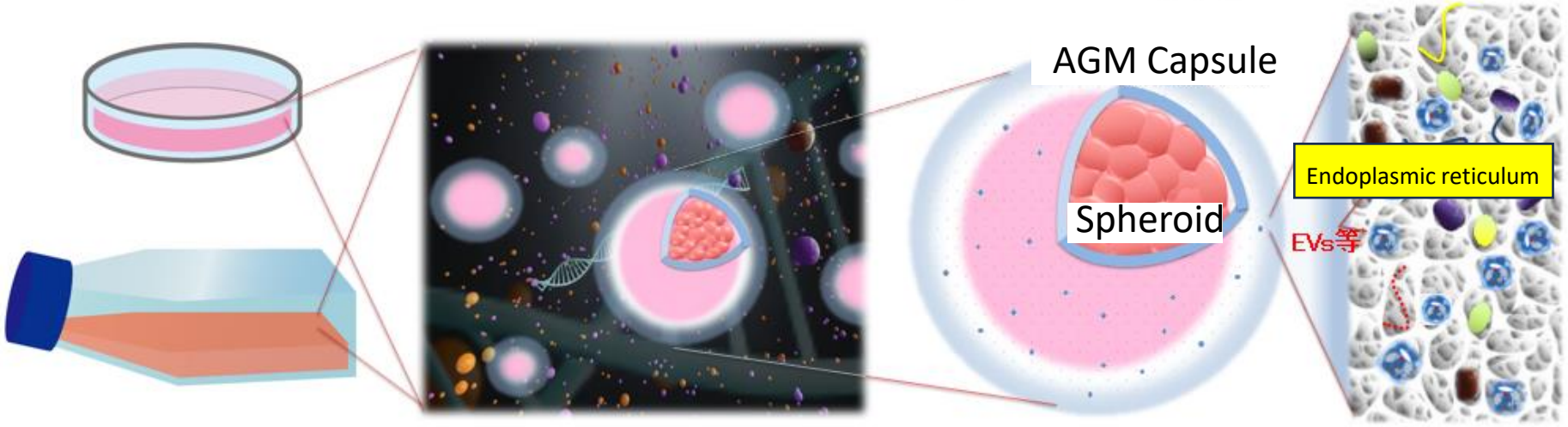
Capsule particle size for microorganisms：30～500μm

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Schematic diagram of utilization of 3D microcapsules for animal cell culture (no special equipment required)

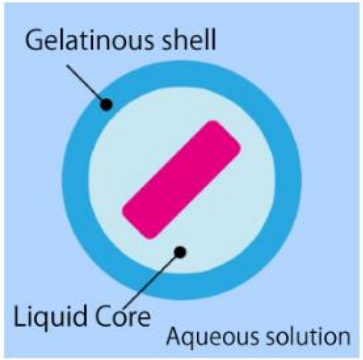
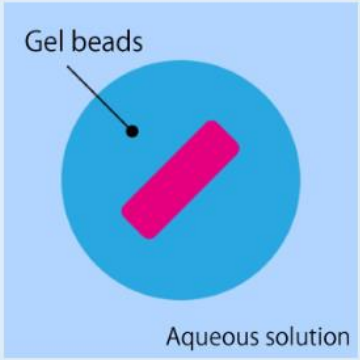
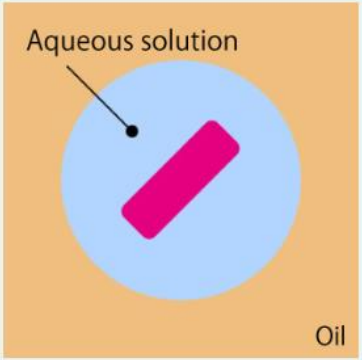
3D Culture in CO2 incubator using AGM



Shell of AGM is porous membrane with its pore size around 200nm. That enables you to exchange the medium , gas and so on. This shell also work as protect layer against damage from sheer force in bioreactor

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Comparison of AGM capsules for animal cells and existing embedding methods

	AGM(Toyo Method)	Gel Beads Method	Water-in-Oil Water-in-Oil Droplet
Appearance			
Drug components move in and out of droplet	Yes	Yes	No
Mobility inside of the droplet	Yes	No	Yes
Taking-out of cell contained-in	Yes	Yes	No

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AGM™ : 3D Culture Microcapsules for Animal Cells

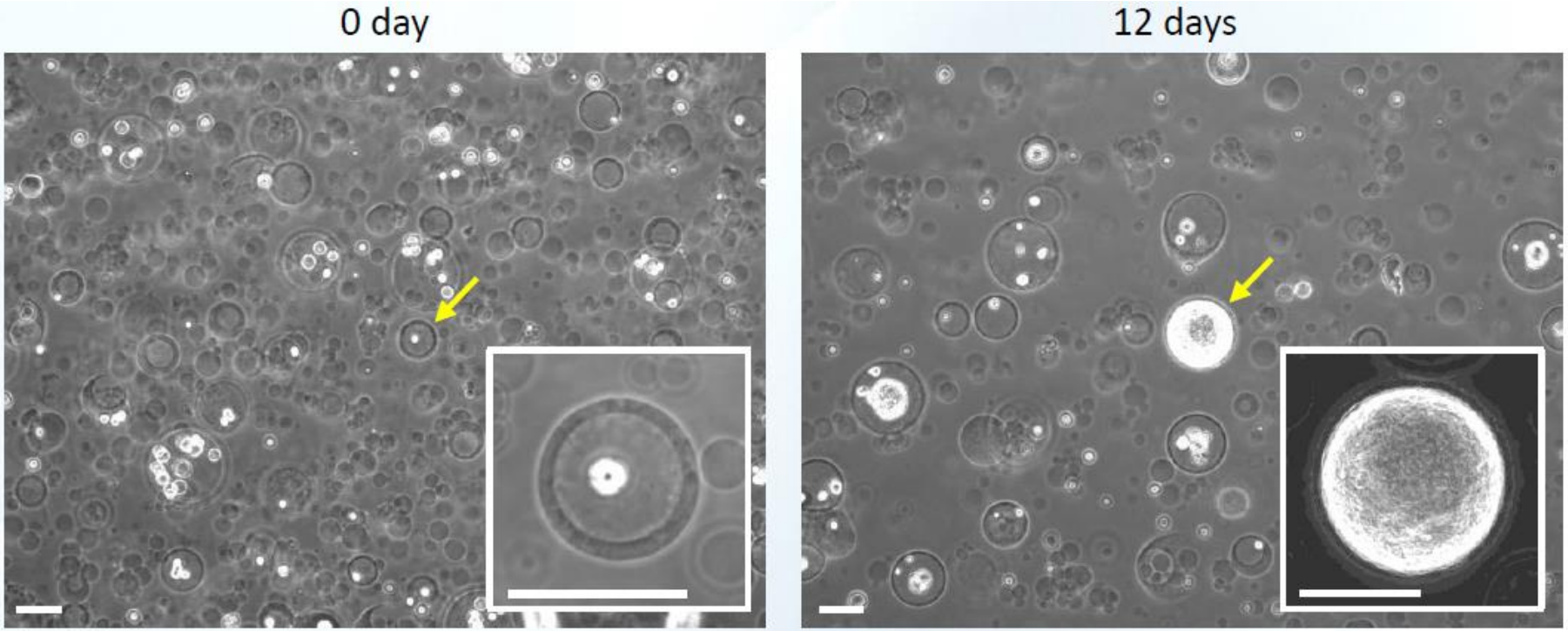
Functions and features possessed by AGM for animal cells (partially under verification)

- Cultured cells in the AGM capsule maintain an in vivo mimetic 3D environment
- Suppresses cell degeneration, which is a problem in dish culture environments
  - Suppresses cell damage due to shear force during medium exchange
- Rapid medium and gas exchange is possible due to the use of porous membranes.
- Protects cells from shear force in the bioreactor
- Contributes to improved viability during spheroid culture
- Application to organoids is under investigation
- Can be used as a co-culture capsule for multiple cells

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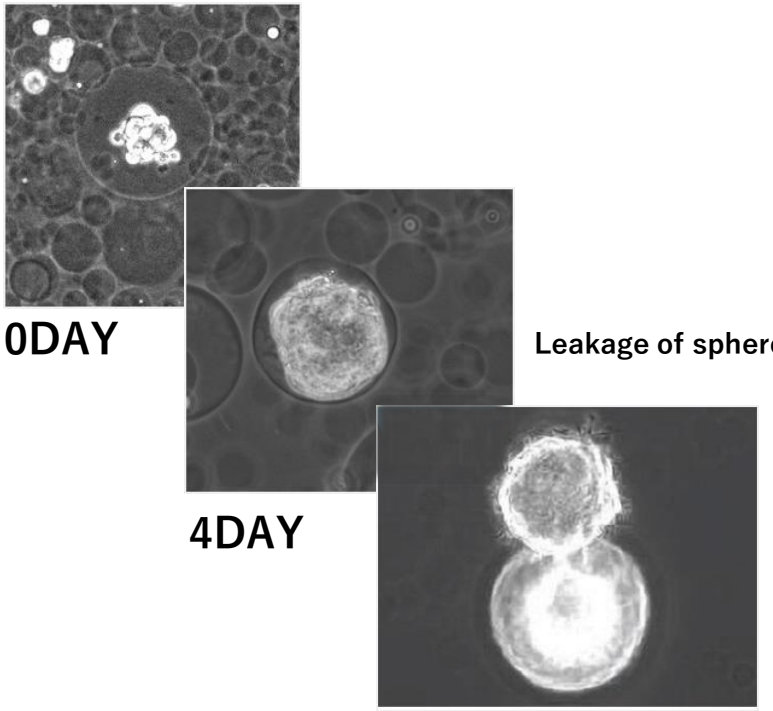
Example of spheroid formation in AGM capsule: cancer cell MCF-7



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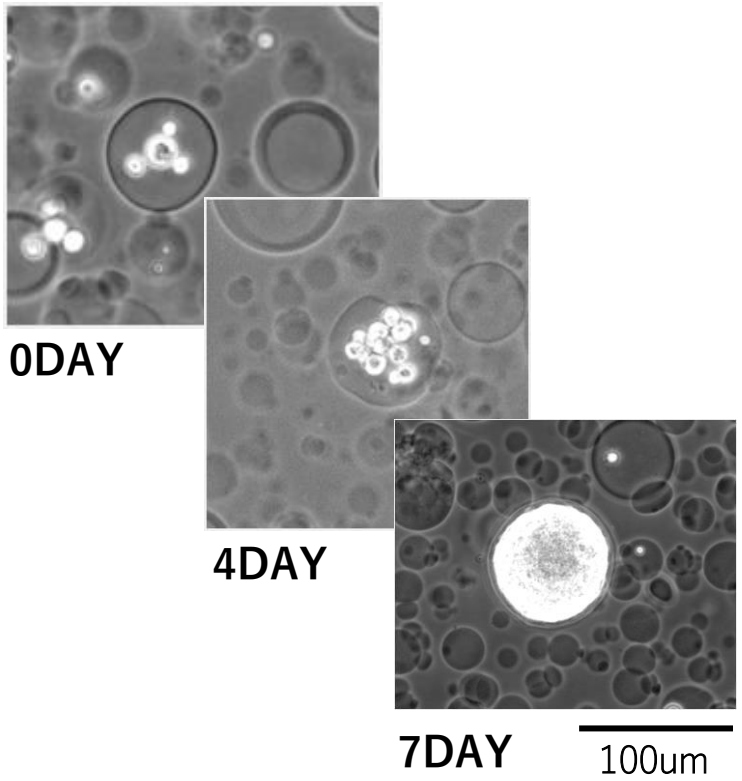
Cell culture with AGM, spheroid formation, and time lapse

MCF7



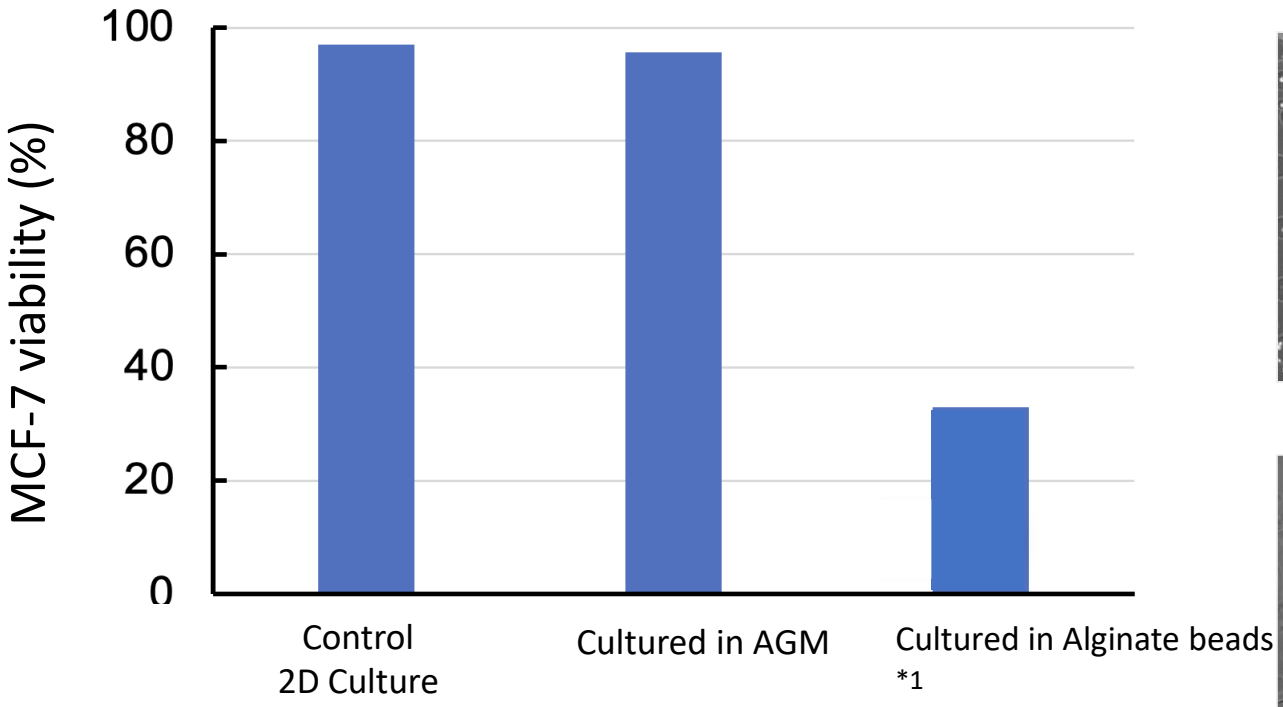
Leakage of spheroid

CHO-K1



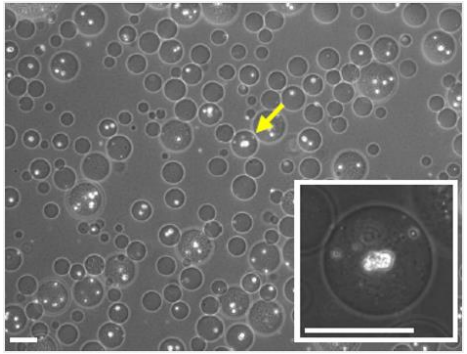
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Cell viability in AGM and conventional alginate cores

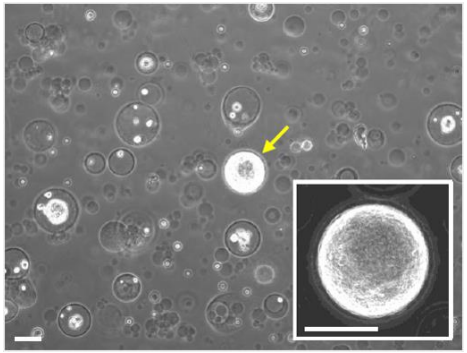


*1 Poncelet D (2001)

Cultured in Alginate beads MCF-7

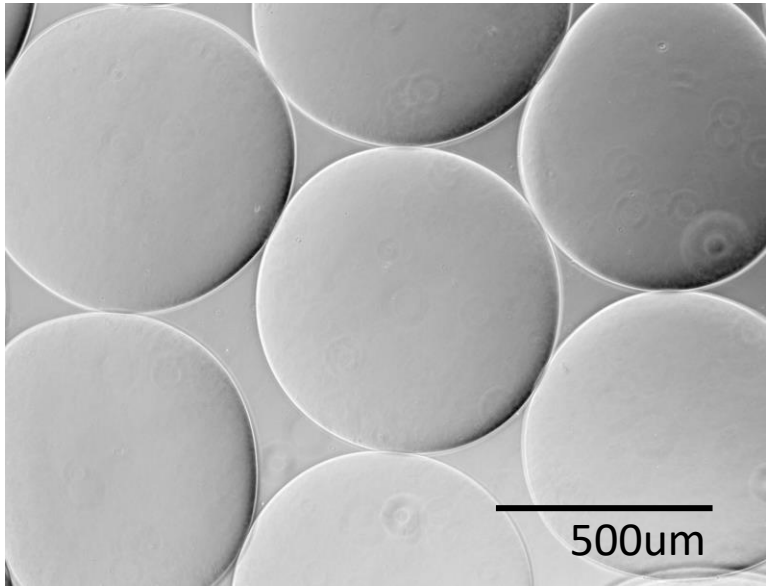


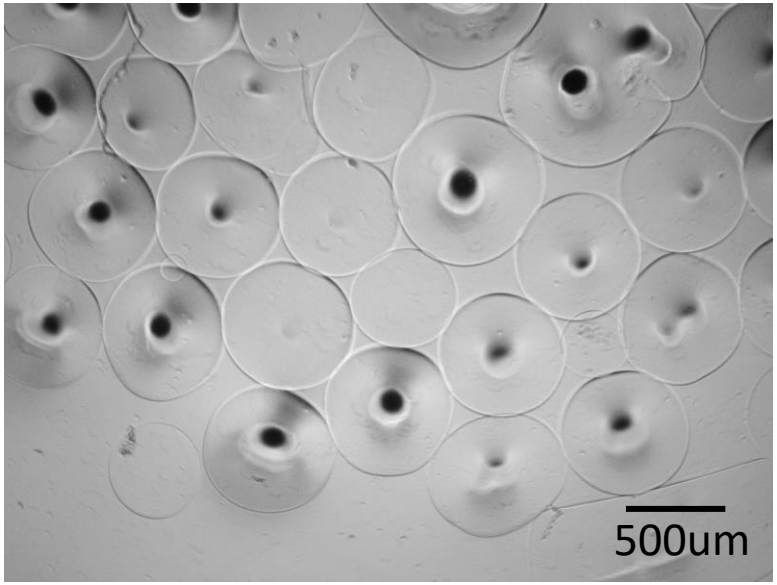
Cultured in AGM MCF-7



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Generation of large diameter AGM





Verification of large diameter size alginate beads preparation, example of preparation by in-house technology

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AGM 3D Cell Culture Usage

For the acquisition and collection of extracellular metabolites such as exosomes

For separation and collection of extracellular endoplasmic reticulum, etc. utilizing **AGM**'s porosity (ϕ 200 nm).

For application research to Organ on Chip

Technical research utilizing spheroid/organoid and other.

Utilization as a capsule for cell preservation and transport

Can be utilized for cell preservation after culture.
Prevents shear breakdown by culture medium during transportation.

For cell-based drug efficacy evaluation research

Allows rapid chemical exchange for cultured cells.
Enables high-throughput evaluation with cells.

For food research

AGM is safe as a food additive.
As capsules for Intestinal bacteria administration.

As an immune-inhibitory membrane in xenotransplantation research

Isolation structure (agarose membrane) can suppress attacks from immune cells.

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Manual method of AGM capsule adjustment

- Inexpensive and easy production with only basic operations (no special equipment required)
- The entire operation up to encapsulation takes about 4 hours.
- Capsule particle size, quantity, etc. varied.
- The amount of unencapsulated capsules, etc. cannot be specified and varies depending on conditions.
- Target spheroid particle size (capsule size) cannot be specified.

Automation: Droplet Generator, etc.

- Initial investment is required
- Time to encapsulation is about 1 to 1.5h
- Capsule particle size can be set from 30 to 100umϕ. The number of capsules required can be specified.
- Assumable number of cells in a single capsule (by cell quantity and capsule size)
- Reduces the number of capsules without embedding.

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