CarbGeM Inc.

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CarbGem

Business Enhancement leveraging DX/AI

Creating New Value Through Image Recognition AI and Generative AI

Image Recognition AI

- Acquisition of Visual Characteristics
  - Object Detection
  - Early Detection
  - Classification

X

Generative AI

- Text, Image, Video, Audio Generation
  - Support for Routine Tasks
  - Advanced Personalized Marketing
  - Support for Specialized Operations

Tackle healthcare challenges head-on harnessing the power of AI.

Our strength

Creating New Value Through "Bio" x "Digital (DX/AI)"

Knowledge in the Life Science Domain

- Bio Research Hub (Kobe Biomedical Innovation Cluster)
- Information Hub in US Boston
- In-house capability of medical and pharmaceutical, and Academic Experts

Commitment to Social Implementation

- Projection for social implementation
- Image Sharing Platform (CarbConnect)
- Know-how in QMS etc.
- Operation Process Improvement

Trends in Biotechnology

- Catching and delivering the latest trends
- Owned Media (CarbGeM+)
- Strong network of Academia and Medical KOLs

Experienced Team

- Extensive experience in
- Business planning and development
- AI program medical device development and market entry
- DX/AI Projects across various industries

Life Science DX/AI Solution Case Study

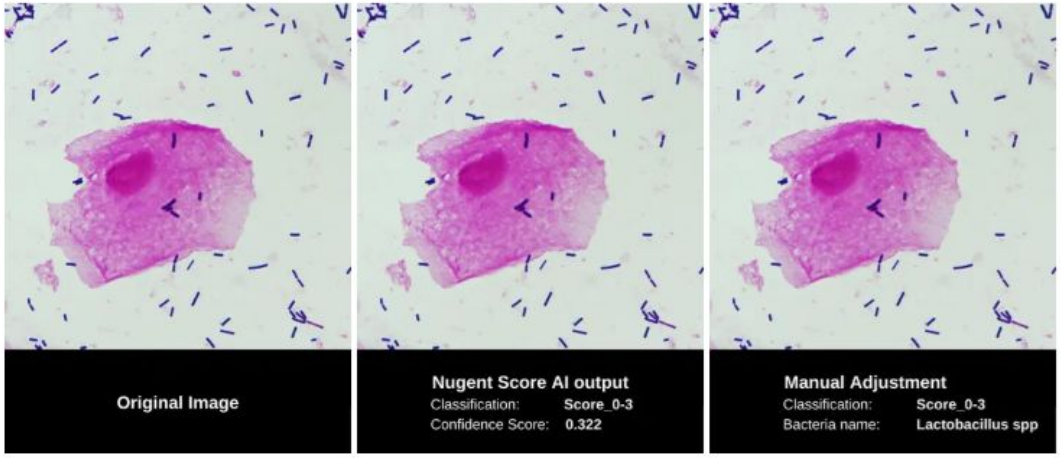
Microbiome Analysis AI (Nugent Score AI)

Project : Microbiome Analysis AI (Nugent Score Ai)

- **Objective:** Using AI to ease the burden on clinicians and enhance diagnostic accuracy for select STIs.
- **Value:**Standardizing Diagnostic Accuracy and Streamlining Workflow
- **Implementation:**
  - Gram-stained images captured with a microscope-mounted camera are analyzed by AI
  - Classified into four stages according to severity. Nugent Score ranges from 0 to 10

Using AI to ease the burden on clinicians and enhance diagnostic accuracy for select STIs

- Improved efficiency for laboratory staff
- Diagnostic support



*Watanabe N, Watari T, Akamatsu K, Miyatsuka I, Otsuka Y. Performance of Deep Learning Models in Predicting the Nugent Score to Diagnose Bacterial Vaginosis.2025 Jan 7;13(1):e0234424

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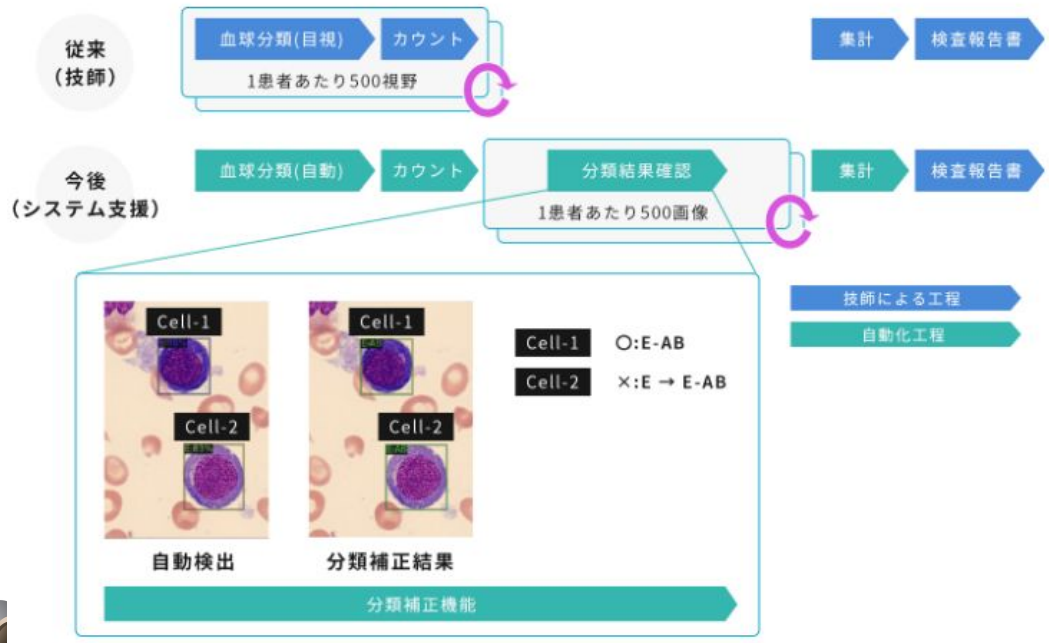
Life Science DX/AI Solution Case Study

AI-Powered Classification for Peripheral Blood Cells in Bone Marrow Smears

■ Project: AI-Powered Classification for Peripheral Blood Cells in Bone Marrow Smears

- **Objective: Support for the classification of peripheral blood cells for MDS (Myelodysplastic** Syndrome) diagnosis
- **Value:** Standardisation of diagnostic accuracy and efficient operations
- **Implementation:**
  - AI analyses microscopic images of smears and automatically detect and classify blood cells.
  - Streamlining operations with automated aggregation of classification results.



Standardisation of diagnostic accuracy
Efficient operations

Standardizing diagnostic procedures that are challenging to pass on
High-throughput cell classification leveraging AI

Life Science DX/AI Solution Case Study

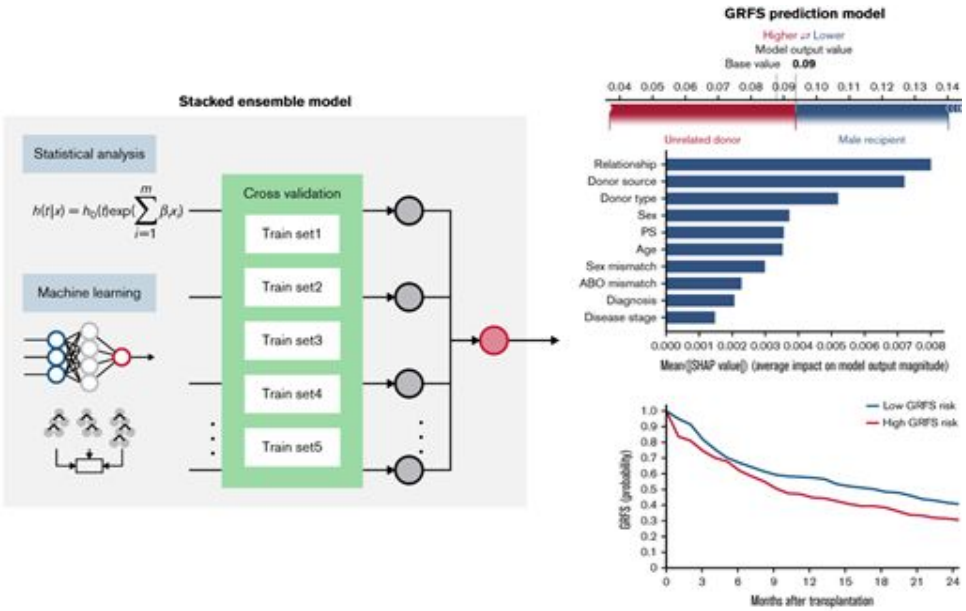
AI for Donor/Recipient Matching in Hematopoietic Stem Cell Transplantation

Project：Donor/Recipient Matching in Hematopoietic Stem Cell Transplantation

- **Objective**:Selecting the Optimal Donor Candidate for Transplantation (Cord Blood Banks and Bone Marrow Registries)
- **Value Proposition**:Avoidance of severe complications such as GVHD and improved prognosis prediction
- **Implementation**:
- AI predicts the prognosis for each donor candidate by analyzing data from cord blood and bone marrow banks, along with recipient (patient) information and conditioning regimens.

Blood Advances

Establishment of a Predictive Model for GvHD-free, Relapse-free Survival after Allogeneic HSCT using Ensemble Learning



Prognosis Prediction:
Optimal donor information based on historical transplant outcomes is provided through a cloud-based system.

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Life Science DX/AI Solution Case Study

Image AI-Powered Bacteria Estimation in Infectious Diseases

■ **Project: Image AI-Powered morphology/species estimation of causative bacteria in Infectious Diseases**

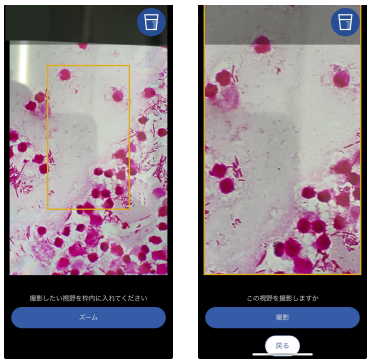
- **Objective:** Early estimation of causative bacteria, leading to the appropriate empiric antimicrobial treatment
- **Value:** Estimation accuracy equivalent to specialists in infectious disease
- **Implementation:**
  - Learning dataset of the pairs of Gram-stained images and identified bacteria species
  - With an automated gram stainer, Gram stain quality is highly homogeneous.
  - Standardizing image quality using lens and smartphone attachment and smartphone app

Standardizing specimen preparation

Remove difference between technicians
MInimizing variation due to methods/reagents

Standardizing image acquisition

Homogeneous capture condition (Hard)
- integration of lens and a smartphone case (left)
Uniform image capture magnification (soft)
- consistent image quality and magnification with the app



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Life Science DX/AI Solution Case Study

Real-time Detection of Transmitted Light Intensity change Using Image recognition AI

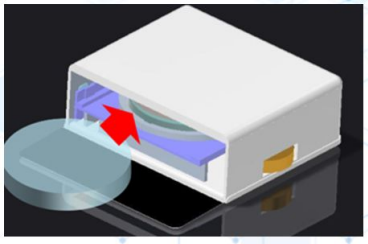
■ **Project: Real-time detection of transmitted light intensity change usingi image recognition AI**

- **Objective:** Early diagnosis of infectious diseases (early detection of minute change)
- **Value:** Rapid diagnosis and treatment in clinical settings and improved workflow efficiency.
- **Implementation:**
  - **Combination of thin-film transistor (TFT) light sensor developed by Japan Display Inc. and CarbGeM's image recognition AI.**
  - **Automated measurement of bacterial growth based on transmitted light intensity on a culture medium.**

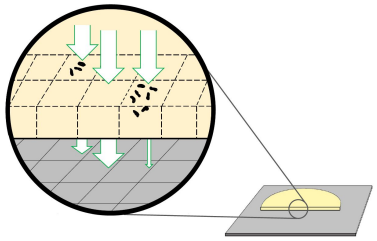
※Press release：2024/11/22

Collaborative development of "SOLTIMO-M" with Japan Display Inc. (TSE: 6740) (Japanese only)

Standardization of image acquisition

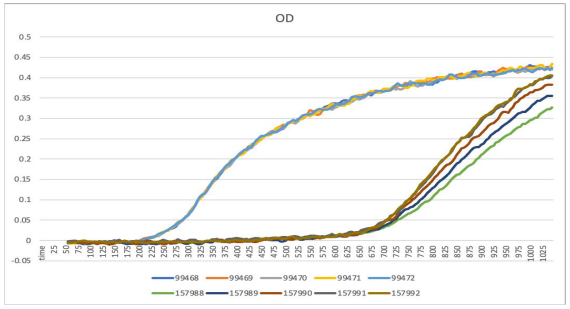


Specialized measurement device



Measurement of transmitted light intensity by TFT light sensor

Early detection by AI



Creating new value by integrating the device and image recognition AI realizeing the detection of minor change

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Life Science DX/AI Solutions

Know-how Cultivated in Medical Device Development for clinical testings

What is Life Science DX/AI Solutions

Provide **DX/AI solutions** including **image recognition AI** to resolves challenges in the healthcare and life science.
Leveraging the know-how and expertise obtained in product development of medical devices utilizing DX/AI in the clinical testing fields.

Our services are tailored for:

Company

Pharma. CRO, Medical Device
Food Industry

Enterprise

Opportunity of Busines
in life science industry

R&D

Academia, Startup
Medical facility

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One-Stop DX/AI Solutions

Inclusive support from requirements definition, UI/UX design, PoC, DX/AI development, implementationt

Requirement definition/Use cases

Implementation/Running

PoC (Proof of Concept)

Continuous improvement
KPI monitoring

DX Strategy

Basic Experiment Data

Preliminary algorithm

Data analysis Evaluation

AI model development

AI model implementation

Running Improvement

Rich knowledge and network in the life science industry

Presentations at top-level conferences inside/outside Japan

Rapid acquisition of training data for AI at the CarbGeM's lab.
Preliminary experiments and validations

Support by rich-experienced members in the medical device regulatory.

In-house ethical committee

Rapid PDCA cycle by one-team structure of wet and dry practices

Extensive network of KOLs in various fields.

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Company Overview

Focus on AI-backed diagnostic technology for AMR and infectious diseases

- **CarbGeM Inc.**（URL https://carbgem.com/en/）
- **CEO: Masakazu Nakajima　　Foundation：** March, 2021
- **Location：TOKYO (Headquarter), KOBE (Bio lab.), BOSTON (Innovation lab. (Prep))**
- **Vision：**To protect humanity from the threat of infectious diseases and realise a safe and secure global society.
- **Scope of Business：**
  - Development and provision of life science AI solutions.
  - Development and provision of life science products.
  - R&D and sales of AI/Bioinformatics in a field of infectious disease and microbiology
- Medical device manufacturing and distribution license

Collaborators*

NCGM National Center for Global Health and Medicine
KOBE UNIVERSITY 神戸大学
Kameda Medical Center
慶應義塾大学病院 Keio University Hospital
広島大学
Northwell Health
University of Zurich[UZH]
UNIVERSITAS INDONESIA Veritas, Probitas, Iustitia | Est. 1849
BỆNH VIỆN BẠCH MAI BACH MAI HOSPITAL

Grants and Subcidiary

AMED Japan Agency for Medical Research and Development
JETRO Japan External Trade Organization
SBIR
Medical Excellence JAPAN
BRI Biomedical Research and Innovation Foundation 2000 KOBE
Be a Great Small 中小機構
TOKYO METROPOLITAN GOVERNMENT
Shinagawa City 品川区

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CarbGeM

Comprehensive Solutions

Solving Challenges in the Life Science Industry with focus on Image-Based Solutions

Enduser

- Life science company
- University Research Institute
- Hospital Medical facility
- Others

Value

- Standardization
- Automation Expedition
- Efficient workflow Alternative workforce
- Recognition training
- Remote Supporting
- Business Development
- Image sharing and storage
- Image analysis
- AI cloud
- POCT
- Low/No Code AI Development
- Industry- Univ. Collaboration

Image AI Platform

CarbConnect®
Cloud-based AI image analyzing platform

Products

AI solution function

- Carbgem App
  - Zone of inhibition
  - New
  - New
- Collaborative App
  - Bacteria estimation
  - Nugent Score AI
  - Bone marrow
  - New
- 3rd Party App
  - New
  - New
- CarbGeM Device
  - 
  - New
- Collaborative Device
  - 
  - New

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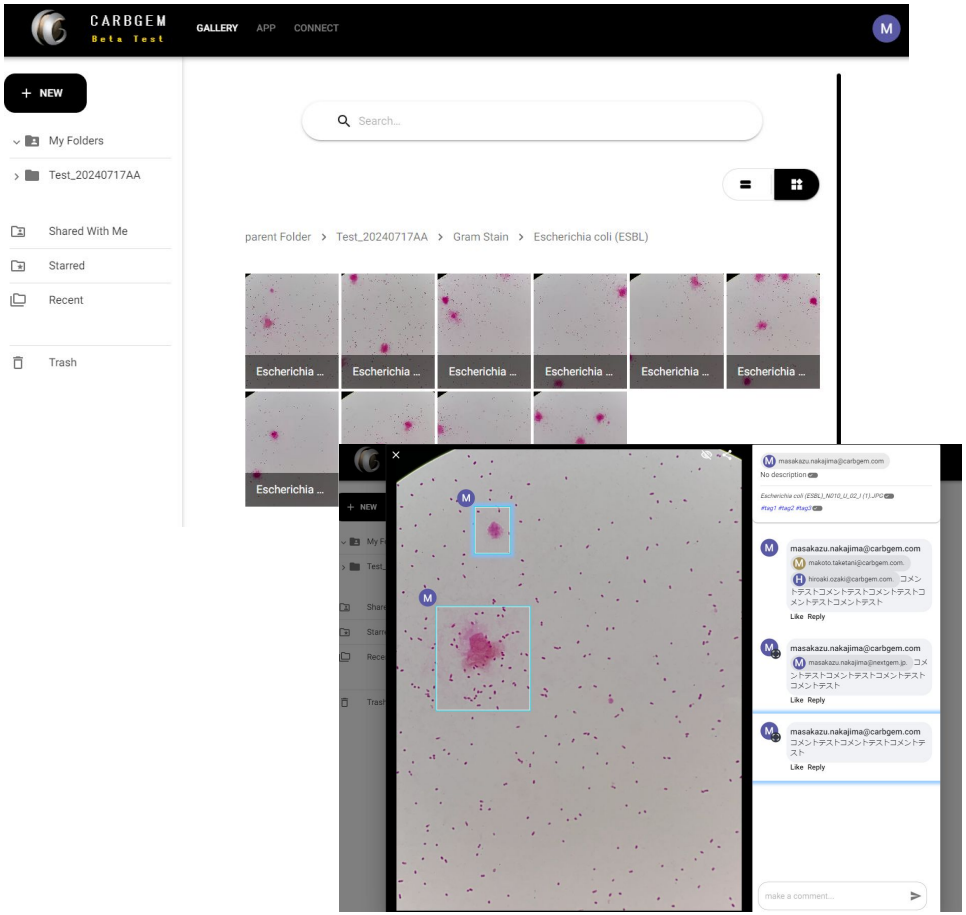
CarbConnect：Overvew

AI/ML image analysis and sharing platform focusing on testings/research

CarbConnect (CBC): Image Data Sharing Platform



Value / Feature

- AI/ML image analysis and sharing platform focusing on testings/research
- Real-time data sharing and access
- One-stop collaboration with applications
- Projected low-code AI model construction

Summary

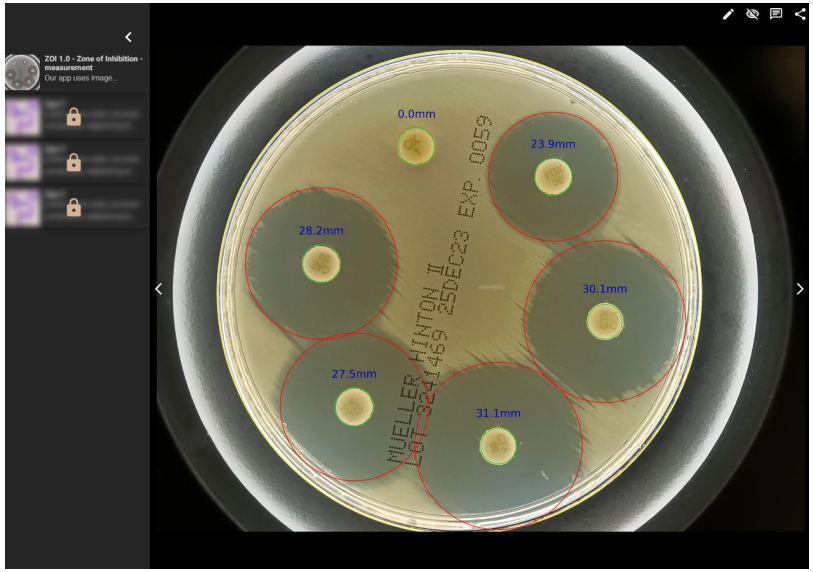
- Core function supports medical professionals and researcher with medical/biological images
- **Image storage and sharing**: images can be uploaded and shared across the globe
- **Communication:** remote communication via messages on an image or its specific regions
- **App Collaboration**:Image analysis app (carbGeM, 3rd Party apps)

※Images are under development, which can be altered.

AI image analysis application: Overview

ZOI（Zone of Inhibition Measurement)

- Automated inhibition zone measurement
- Automates previously manually-measured inhibition zone measurement
- Allows for manual adjustment.
- Carbconnect enabless image storage, information sharing, and communication.



※Images are under development, which can be altered.

BiTTE lite

- BiTTE-iE Entry model (limited function).
- Image recognition AI provides bacterial morphology classification.
- Allows for manual adjustment.
- Carbconnect enables image storage, information sharing, and communication.

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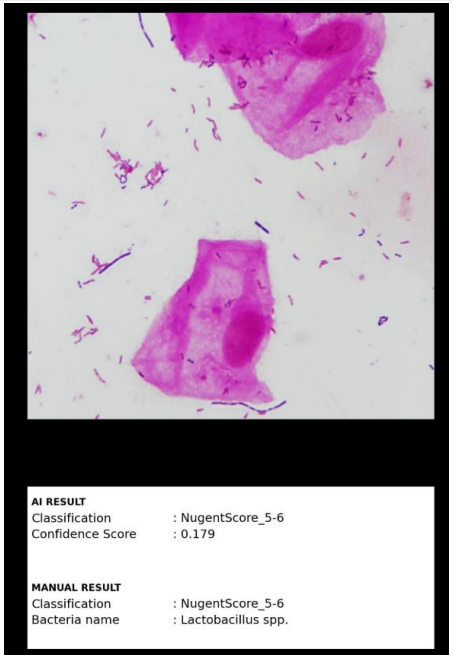
AI Image Analysis Applicaiton: Oveview

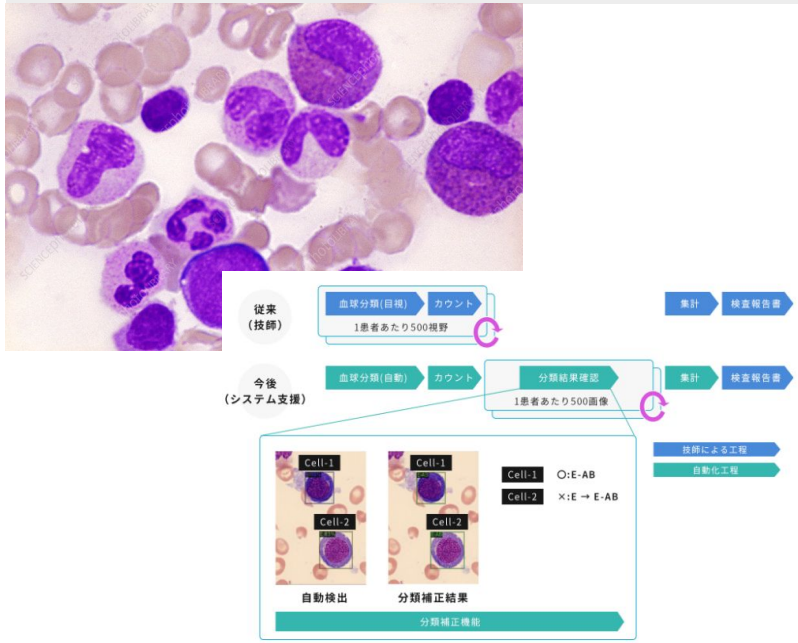
Nugent Score AI

- AI supports Nugent Score classification (four categories).
- Allows for manual adjustment (entering bacteria species etc).
- Carbconnect enabless image storage, information sharing, and communication.



Blood cell classification App

- Support classification previously manually carried out.
- Allows for manual adjustment.
- Carbconnect enabless image storage, information sharing, and communication.



※Images are under development, which can be altered.

Product Introduction

Clinical testing and research in Microbiology

Standardization | Automation Expedition | POCT | Image Analysis

Specimen → Gram Stain → Microscopy → Initial Identification → Prescription (empiric) → Culture/ MS PCR etc → Identification AST → Prescription (definitive)

Prevent interruption of a series of processes and realises optimal testing/diagnosis rapidly.

PoCGS

Portable Gram Stainer

Automation of laborious staining procedure
High quality specimen preparation in five minutes

BiTTE

AI bacteria estimation antibiotic selection App

Support for microscopy of Gram stained specimen and appropriate use of antibiotics in resource-limited settings

CarbConnect

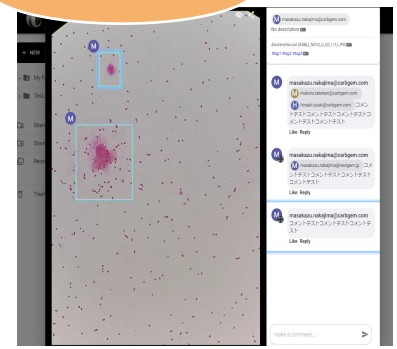


Image analysis and sharing platform

Sharing testing and research images. Supporting analysis and diagnosis by advice and comments by specialists

SOLTIMO

Rapid detection of bacteria culture

Continuous and automated measurement of zone of inhibition. Rapid and standardized antimicrobial susceptibility test

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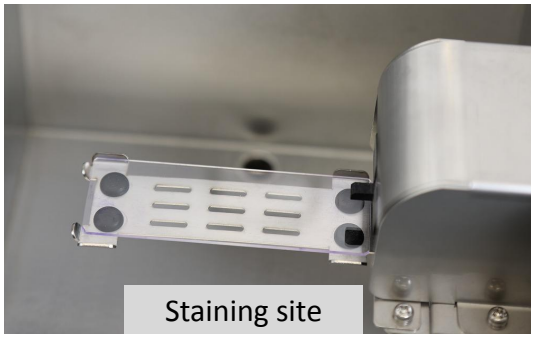
PoCGS® : Overview

Portable Gram Stainer

PoCGS®: Potable Gram Stainer

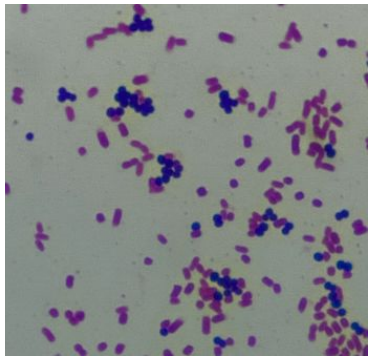
Device

Without a front cover



Staining site

Gram stain image



Value

- Standardisation of staining quality.
- Automation and labour saving for staining
- High-quality specimen in about 5 minutes.
- Compact size: can be installed in locations without drainage facilities.

Summary

- Class I Medical Device (JP, 2024)
- Patent application
- Size：W204 × H350 × D280（mm）
- Weight 8.7kg
- Power Supply AC100V（50-60Hz）
- Processing Capacity: One
- Reagents: Six reagents (including water)
- Drying and automated cleasing
- Standard and customized staining program

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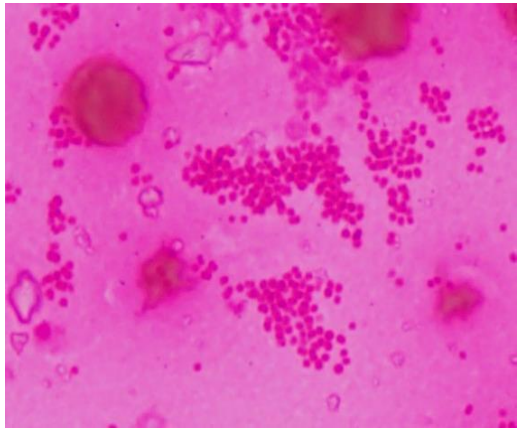
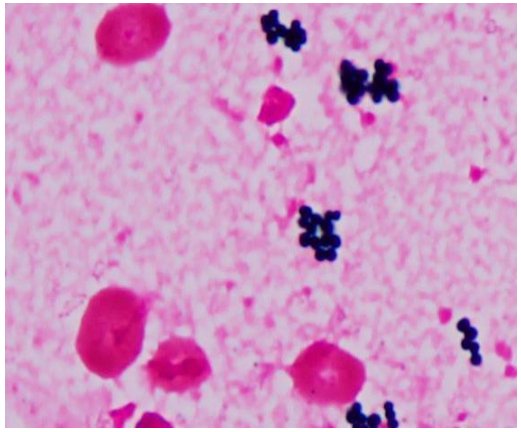
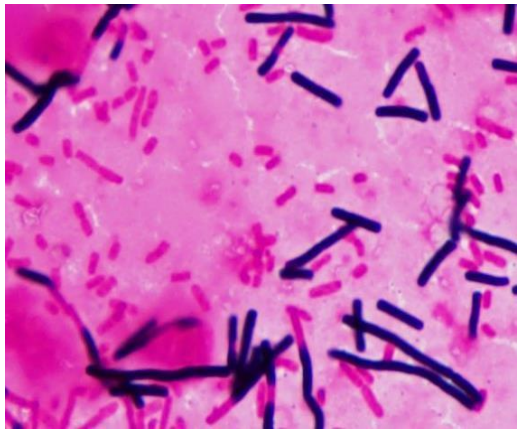
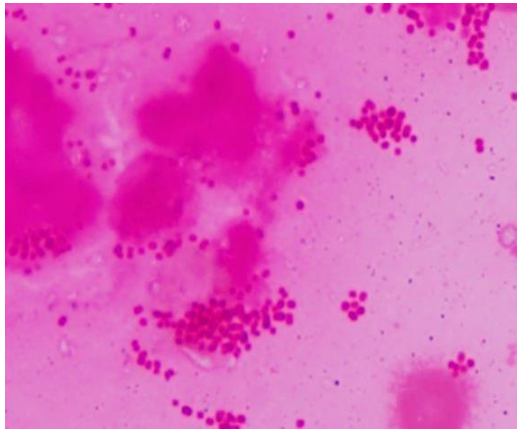
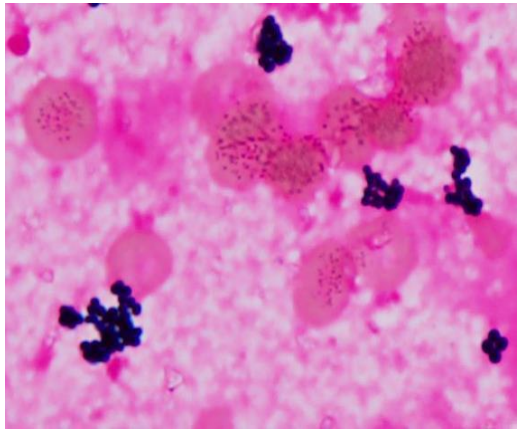
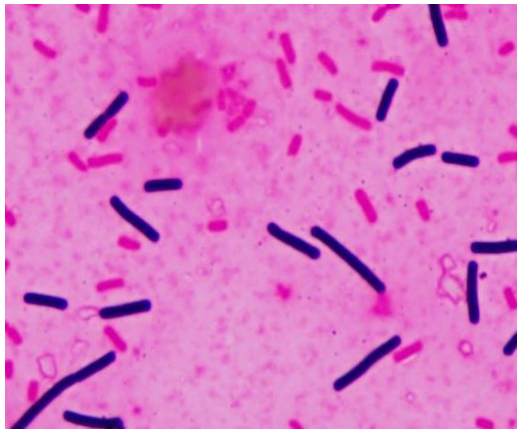
PoCGS® : Performance

Equivalent to experienced clinical technicians (efficient and standardized)

	Neisseria flavescens (Blood culture)	*Staphylococcus aureus* (Blood culture)	*Clostridium perfringens* *Escherichia coli* (Blood culture)
Expert			
PoCGS			

Provided by Kobe University Hospital

BiTTE®：Overview

Smartphone App of AI bacteria estimation and antibiotic selection support

BiTTE®: Bacterial infection teller and treatment estimator

※Images are under development, which can be altered.

Value / Feature

Supporting tool of Gram stain and empiric antimicrobial selection for medical facility/staff

- Clinicians and technicians without speciality
- In an emergency department
- Facility without a microbiologist

Overview

- Image recognition AI estimates bacteria morphology and species
- Propose effective antibiotics based on antibiogram (antimicrobial susceptibility data)
- Non-inferiority to specialists in infectious disease on seven classifications with accuracy of 95%. (Gram positive rods/cocci, Gram negative rods, multiple bacteria, No bacteria, others)
- 15 categories for species as reference
- Show spectrum score, AWaRe classification
- Urine: Class II program medical device
- Blood culture: RUO

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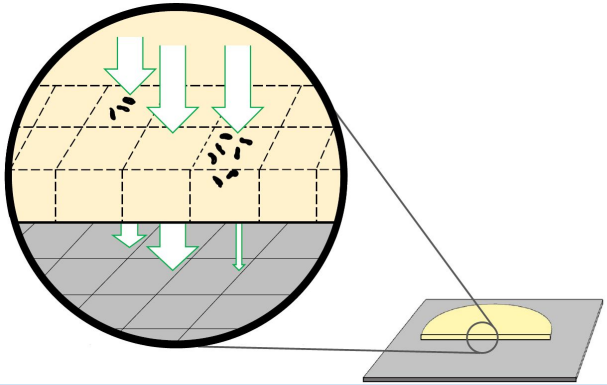
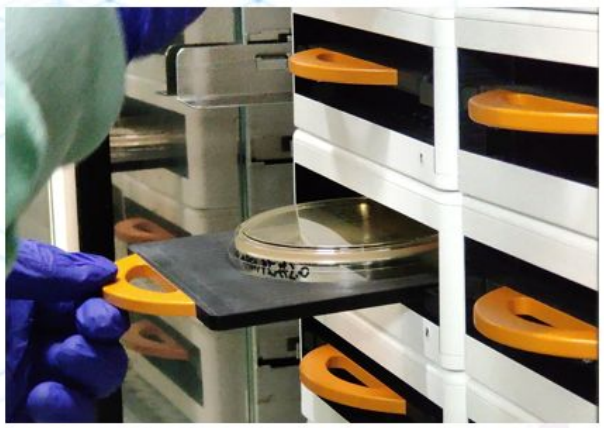
SOLTIMO-M: Overview

Rapid and automated bacteria growth detection on a culture media

Size（W:12, D:20, H:6 cm）



Principle: A sensor measures transmitted light intensity



Devices can be piled up in an incubator.

- Install a device in an incubator, set the culture plate coated with microorganisms inside, and measure growth using a connected PC.
- The sensor measures transmitted light intensity every 5 minutes, and bacterial growth is detected.
- Multiple device can be installed in an incubator.
- Intended Use
  - **Rapid detection of bacteria growth:**
  - Rapid screening of antimicrobial resistance
  - **Automated antibiotic susceptibility analysis**
  - Continuous measurement is also available

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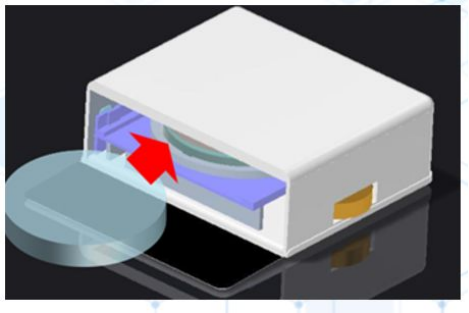
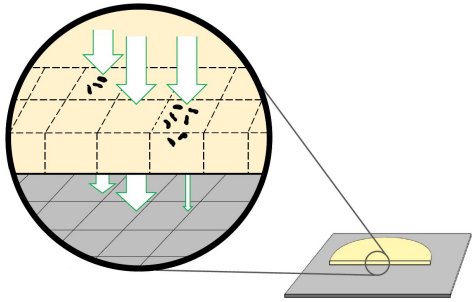
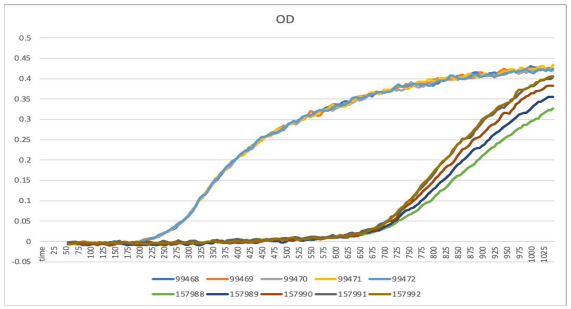
BGM : Overview

Accelerating microbiological research using culture media (Under Dev.)

Bacterial Growth Monitor (BGM)







Vaue / Feature

- Realize first-ever optical density measurement for liquid culture media (Patent applied)
- Growth monitoring on solid culture media
- Detects growth/colony earlier than visual observation or camera-based methods

Summary

- Install a new algorithm in SOLTIMO hardware.
- Enables research on inner colonies and persisters, which were previously difficult to observe.
- Accelerates the development of new antimicrobial agents such as bacteriophages and microcins.
- Promotes joint research with companies doing R&D on microorganisms.

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