미생물 분석기 (PixeeMo)

Rapid detection system for Microbial contamination risk monitoring

Real-time viable microbial monitoring

PixeeMo®

C&T International

씨엔티 식품감각(관능)-영양 연구 장비

Taste Sensing System

맛인식장치(전자혀)
TS-5000Z 제조사 : INSENT

감칠맛, 신맛, 쓴맛, 짠맛, 떫은맛, 쓴맛, 단맛 등 6가지 맛 센서로 인간의 혀와 같은 원리로 식품 및 약품 등 다양한 물질의 맛 정도를 수치화, 독창적인 뒷맛(후미) 측정기술을 사용하여 "깊은맛" 과 "깔끔한맛"으로 표현

01

칼로리 측정기

Calory Answer
CA-HM 제조 : JWP

근적외선 분광 분석법으로 샘플형태에 따라 투과 측정, 반사 측정으로 칼로리 외에 참고 값으로, 단백질, 지방, 탄수화물, 수분 (나트륨, 영분창)등의 영양 성분의 측정

02

Texture Analyzer

식감측정기
TEX-P100N 제조사 : JISC

다양한 지그(Plunger)로 음식물을 압축하여 측정 한 후 질감 프로파일 분석 방법에 따라 경도 및 점착력과 같은 데이터를 자동으로 계산

03

반사율 색차계 577 (5G)

제조사 : Photovolt사

50년 이상 산업계의 표준이 되어 왔고, 외관(밝기, 불투명도 및 색상)에 대한 품질 관리용으로 산업현장에서 사용.
색상측정 및 관련 표준을
Excel 스프레드 시트 형식의 디지털 방식으로 기록

04

신속미생물검사시스템

Rapid Microbiological Testing System
PixeMo 제조사 : AFI

비파괴방식에 의한 미생물 검사 모니터링 시스템으로 25분내에 총미생물수 측정이 가능

05

향 (냄새) 측정장치

Aroma coder, Coder analyzer,
Coder sampler 제조사 : Aroma Bit

냄새 이미징이 가능한 다중 요소 배열 센서 시스템 사용 QCM 기판상의 박막 표면에서 냄새 분자의 흡착/탈착 시 공명 주파수 변화를 분석하여 냄새 이미지 생성

06

매운맛 측정

Food Sense(Scoville Meter)

제조사 : ZP Chilli Technology
칠리 및 칠리를 기반으로 하는 제품의 스코빌 스케일을 1분 이내 정확하게 측정하는 스코빌 측정

07

Frying oil filter & oil Tester

-Portable,Mobile Type
-식용유50%절약
-HACCP conform

08

Company profile : What's AFI ?

Advanced Filtration Industries Technology

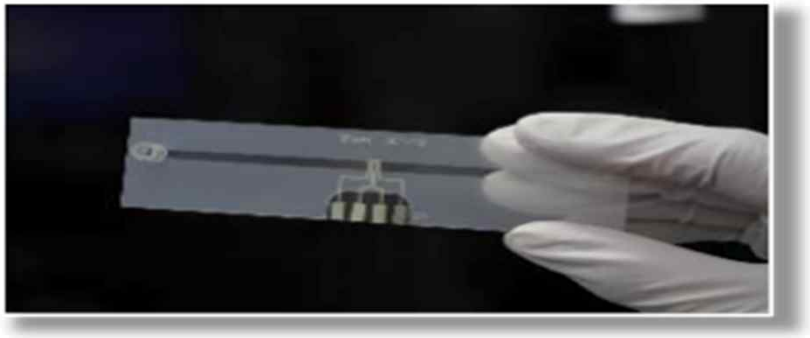
Company name: AFI Corporation
Established: May21, 2013
President and Representative Director: Hiroaki Nishikubo
Head office: Kyoto Japan
Business Description: Development, manufacture and sale of devices, instruments, reagents, etc. related to the evaluation, control and manufacture of cells, microorganisms, etc.

Core Technology AMATAR™

Our mission is to contribute to the society providing innovative products using AMATAR™.

Two Types of AMATAR® Chip

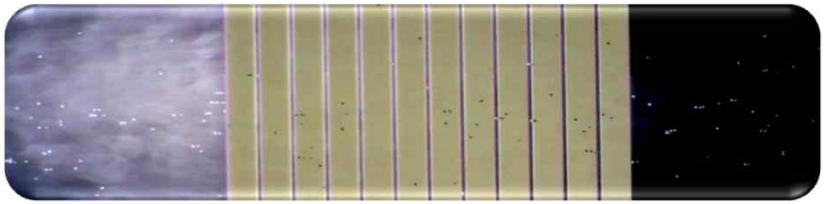
Concentration Type (ELESTA Chip)



CLICK CLICK

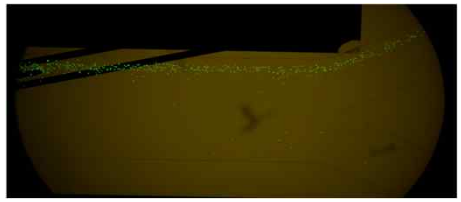
Continuous separation-type (Crosssorter Chip)

microorganisms

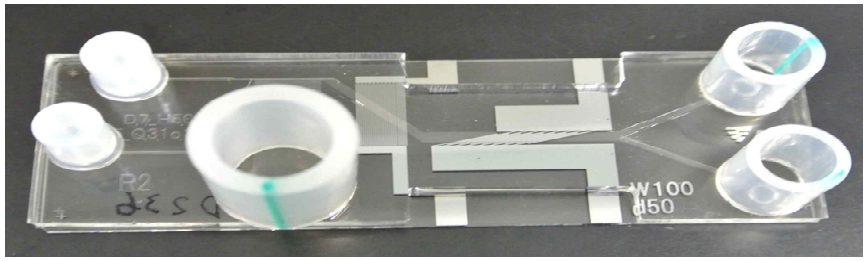


CLICK CLICK

Calcein AM(Live)



EthD-III (Dead)



C&T International

Main products equipped AMATAR®

Real-time viable microbial monitoring

PixeeMo®

AMATAR

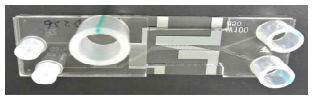
Innovative electric filter using Microfluidic channel /electrode

AFI

Advanced Filtration Industries Technology

Label-free cells analysis

CROSSORTER®



Microbial test market

Food, Beverage, Clinical, etc.

Life science market

Regenerative medicine etc.

C&T International

Pixeemo Usage Area

納入ペース　2台~/月
引合登録件数　118社

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Wide range of Microbiological test field

Food/beverage

HACCP system
Shipping decision
Rapid detection of spoilage bacteria
Species estimation

Pharmaceutical/Clinical

parametric release
Bioburden process control
Appropriate antibiotic judgment
cell formulation
Sterility test

Cosmetics/Healthcare

preservative free
human microbiome
Skin-beautifying bacterial flora analysis
Urinary flora analysis

Environment/Resources

Legionella spp.
swine erysipelas
Bio-mediation
unknown useful microorganisms

PixeeMo System configuration

ELESTA® buffer
This buffer solution is exclusive for Elesta and is used to stabilize the capture rate of target microorganisms.

Sample syringe(1mL/10mL)

Waste cup (Consumables for ELESTA)
Connects to the waste liquid port and collects the sent sample.

PixeeMo®
A rapid microbial monitoring device that can accurately separate and capture minute amounts of microorganisms mixed in samples

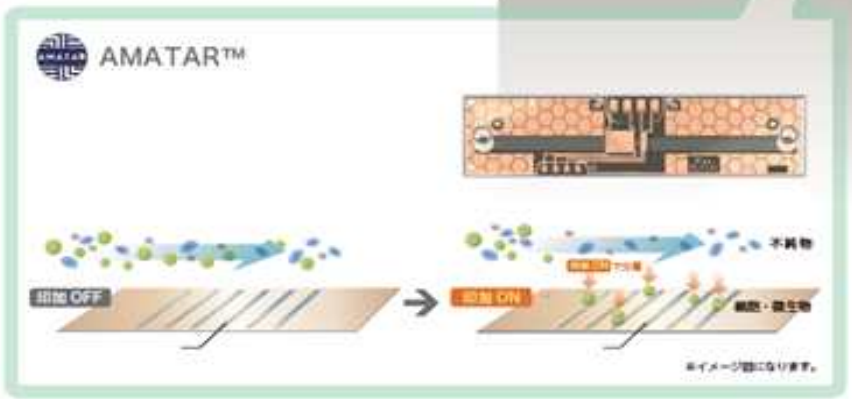
ELESTA® counter
Dedicated software that automatically measures microbes captured by ELESTA chip using original image technology.

Centrifuge

Used together depending on the type of sample

*It is not an accessory.
Please purchase separately

Table size(Approx.)
Width 1200mm x Depth 600mm



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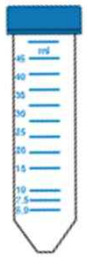
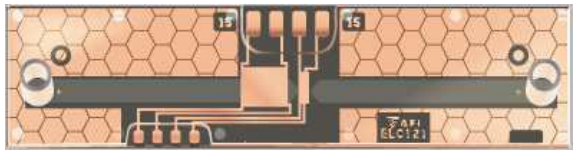
Basic Operation (video)

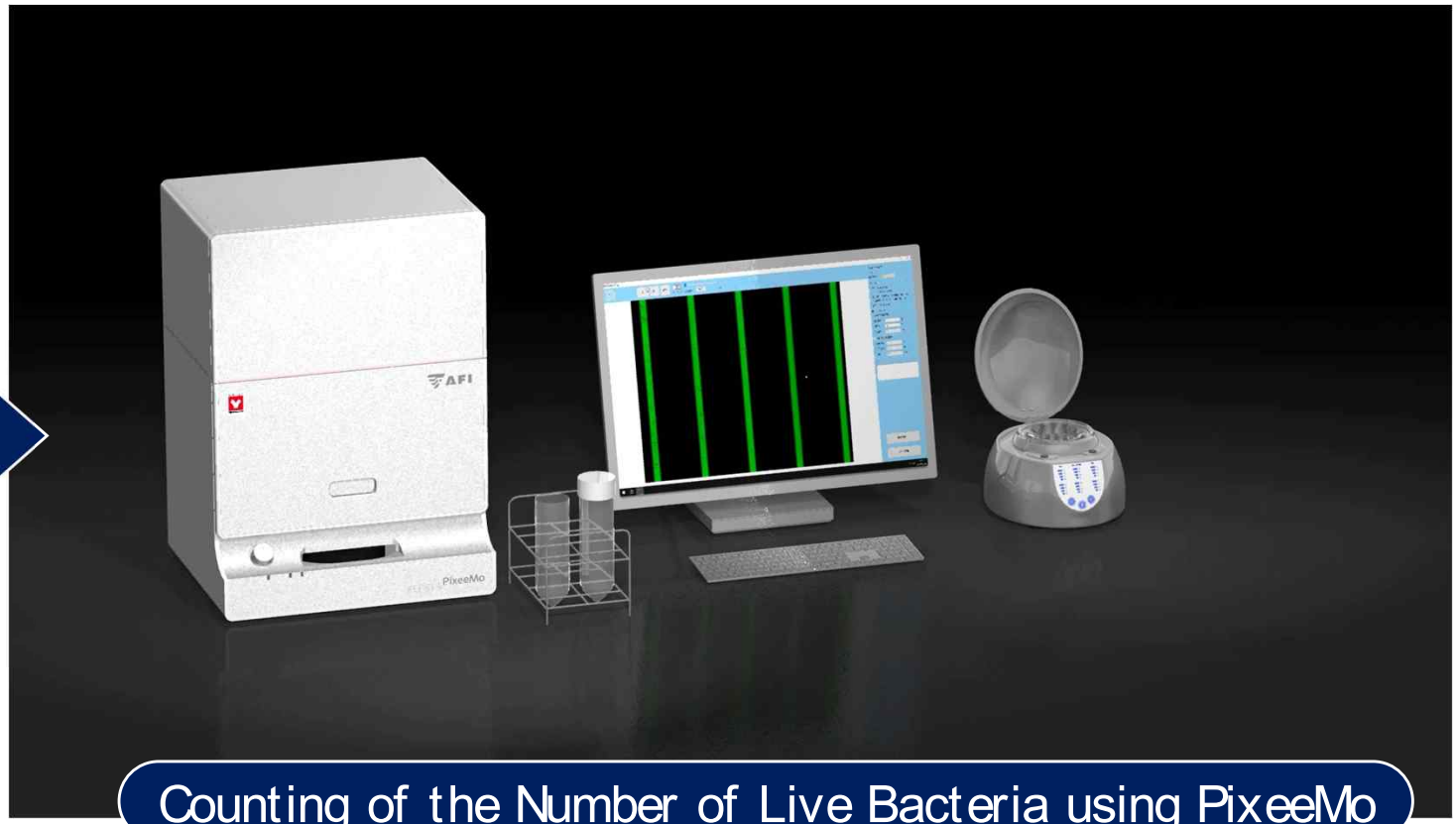
Samples



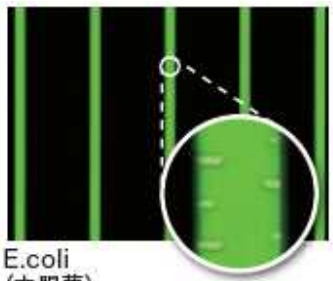
Pretreatment

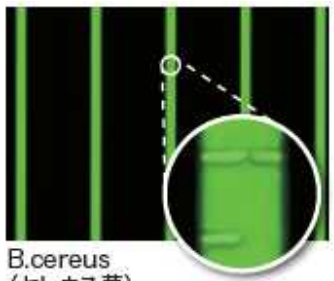
CLICK

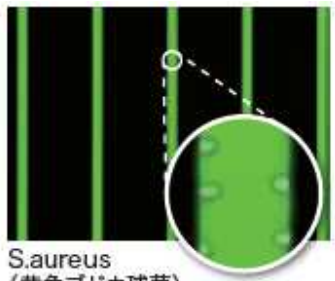




Counting of the Number of Live Bacteria using PixeeMo


E.coli
(大腸菌)


B.cereus
(セレウス菌)


S.aureus
(黄色ブドウ球菌)

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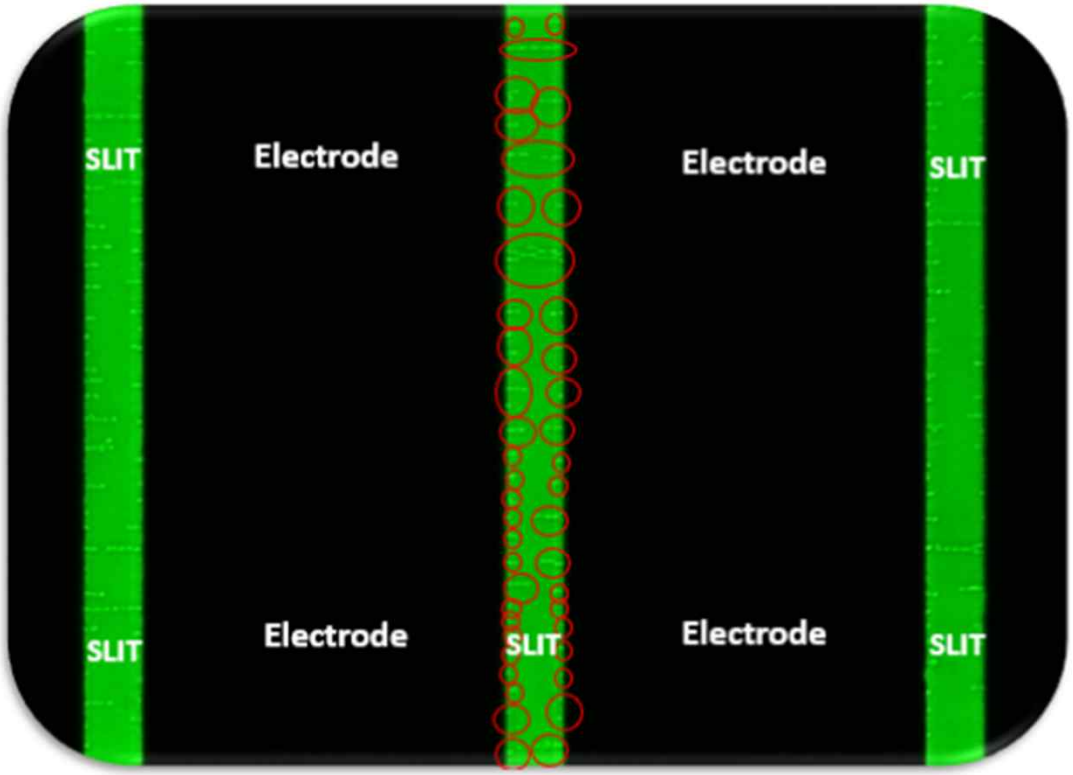
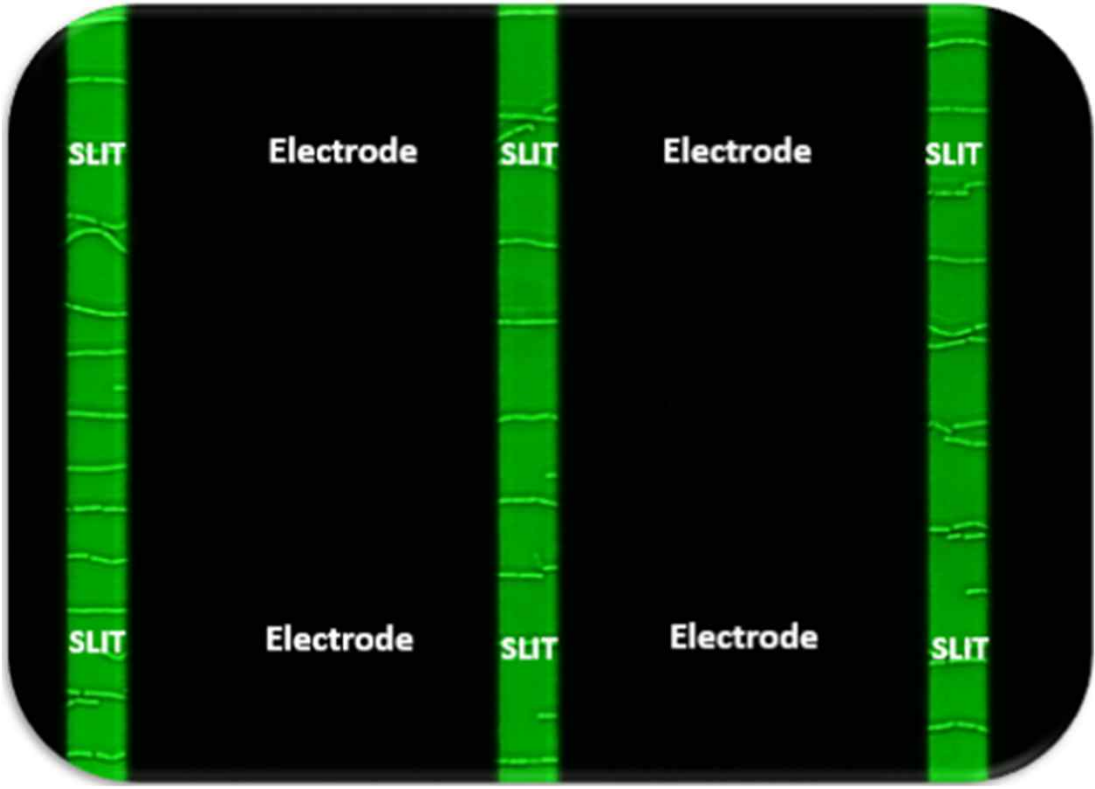
Shape of trapped

Escherichia coli

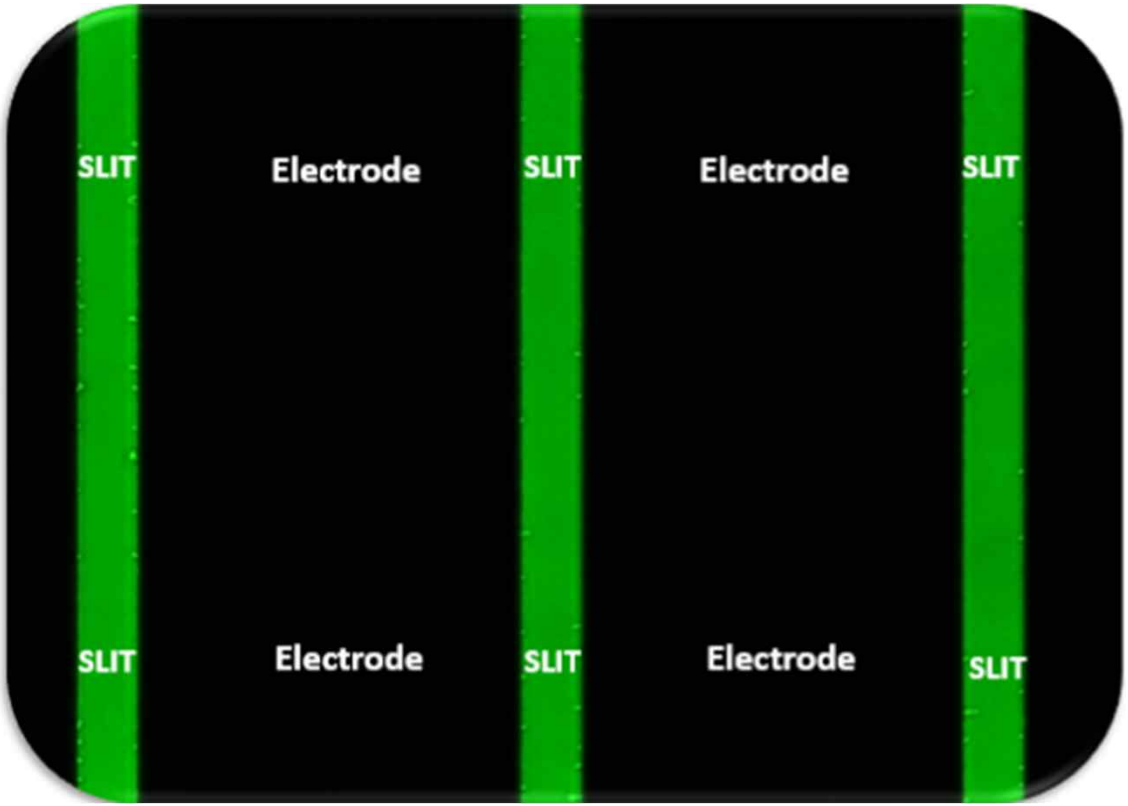


Bacillus cereus

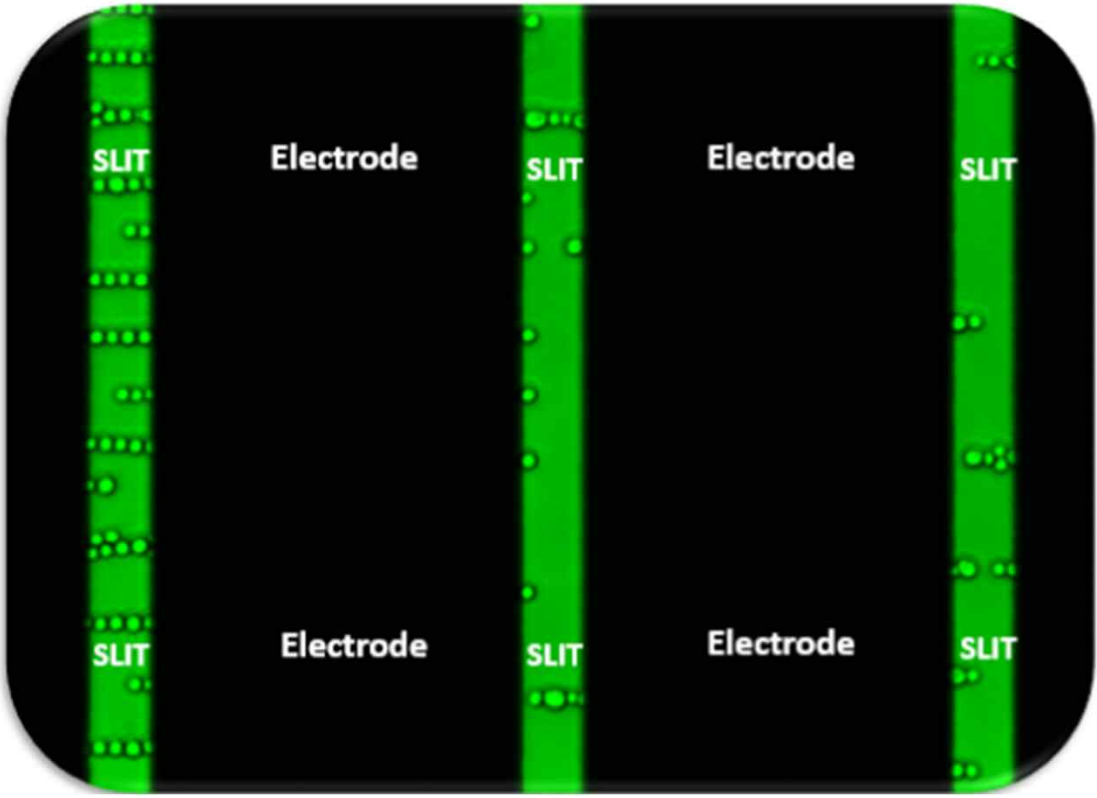


Shape of trapped

Staphylococcus aureus



Candida albicans



Basic performance of PixeeMo

Measurable sample：	**Solid, liquid, powder, viscous (10-fold dilution other than liquid)**
Target microorganism：	**Viable bacteria in general (high-, medium-, and low-temperature microorganism, conidia, yeast, spores)**
Lower limit of detection：	**10^2cells/g (10^1cells/ml for liquids)**
Pretreatment method：	**Centrifugal supernatant replacement (using dedicated buffer)**
Pretreatment time：	**About 5 to 15 minutes**
Measurement time/sample：	**Around 25 min/sample (5 min/sample for detection sensitivity of 10^3cells/g or more)**
Correlation with culture method：	**90% or more (actual basis)**

AOAC PTM certification
for analysis method by PixeeMo® (2020.1)

AOAC INTERNATIONAL
JAPAN SECTION

AOAC RESEARCH INSTITUTE

CERTIFICATION

AOAC® *Performance Tested*SM

Certificate No.

012002

The AOAC Research Institute hereby certifies the test kit known as:

PixeeMo™

manufactured by

AFI Corporation
3rd Fl, Med-Pharm Collaboration Bldg.
Kyoto University
46-29 Yoshida Shimoadachi-cho
Sakyo-ku, Kyoto 606-8501

This method has been evaluated in the AOAC® *Performance Tested Methods*SM Program and found to perform as stated by the manufacturer contingent to the comments contained in the manuscript. This certificate means that an AOAC® Certification Mark License Agreement has been executed which authorizes the manufacturer to display the AOAC *Performance Tested*SM certification mark along with the statement - "THIS METHOD'S PERFORMANCE WAS REVIEWED BY AOAC RESEARCH INSTITUTE AND WAS FOUND TO PERFORM TO THE MANUFACTURER'S SPECIFICATIONS" - on the above mentioned method for a period of one calendar year from the date of this certificate (January 14, 2020 – December 31, 2020). Renewal may be granted at the end of one year under the rules stated in the licensing agreement.

Scott Coates

Scott Coates, Senior Director
Signature for AOAC Research Institute

January 14, 2020
Date

2275 Research Blvd., Ste. 300, Rockville, Maryland, USA Telephone: +1-301-924-7077 Fax: +1-301-924-7089
Internet e-mail: aoacri@aoac.org * World Wide Web Site: http://www.aoac.org

C&T International

Proven facts by AOAC-PTM certificate

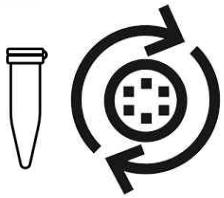
- 국제 표준 방법과 높은 상관 관계
- 여러 개의 PixeeMo 간 검사 결과의 차이가 없음
- 전용 소모품 lot 간 검사 결과의 차이가 없음
- 유통 기한 내의 소모품 품질의 균일
- 운영 실수에 대한 고강도 내구성

PixeeMo는 제3자 인증 기관에 의해 인증된 유일한 **rapid non-culture method** 입니다.

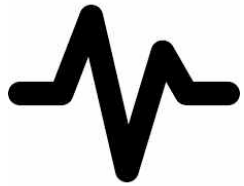
Separation protocol determination flow

① Check the properties of the sample

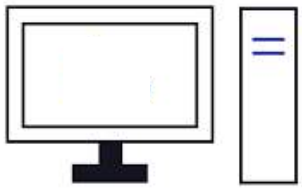
② Examination of pretreatment method



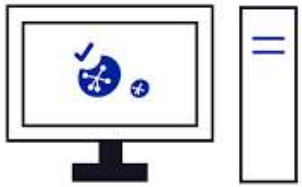
③ Check the frequency characteristics of component particles



④ Send 1ml liquid by PixeeMo (no bacteria)



⑤ Send 1ml liquid by PixeeMo (with bacteria)



Tips of pretreatment : by sample characteristics

For normal solid samples

10× dilution → stomaching → high-speed centrifugal replacement

For high viscous samples

Dilution → high-speed centrifugation supernatant replacement

For liquid samples

high-speed centrifugal replacement

For samples with large particles

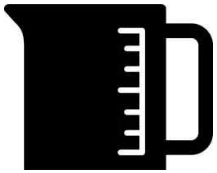
Low-speed centrifugation supernatant recovery
→ high-speed centrifugation replacement

For water samples to check sterility

10× dilution → high-speed centrifugal replacement

For samples with small specific gravity of particles

medium-speed centrifugal displacement



For large volume liquid samples

Microfiltration enrichment →Rinse with 20ml buffer in 50ml tube

For antimicrobial samples

10× to 30× dilution with dedicated inactivating agent or liquid medium→ high-speed centrifugal replacement

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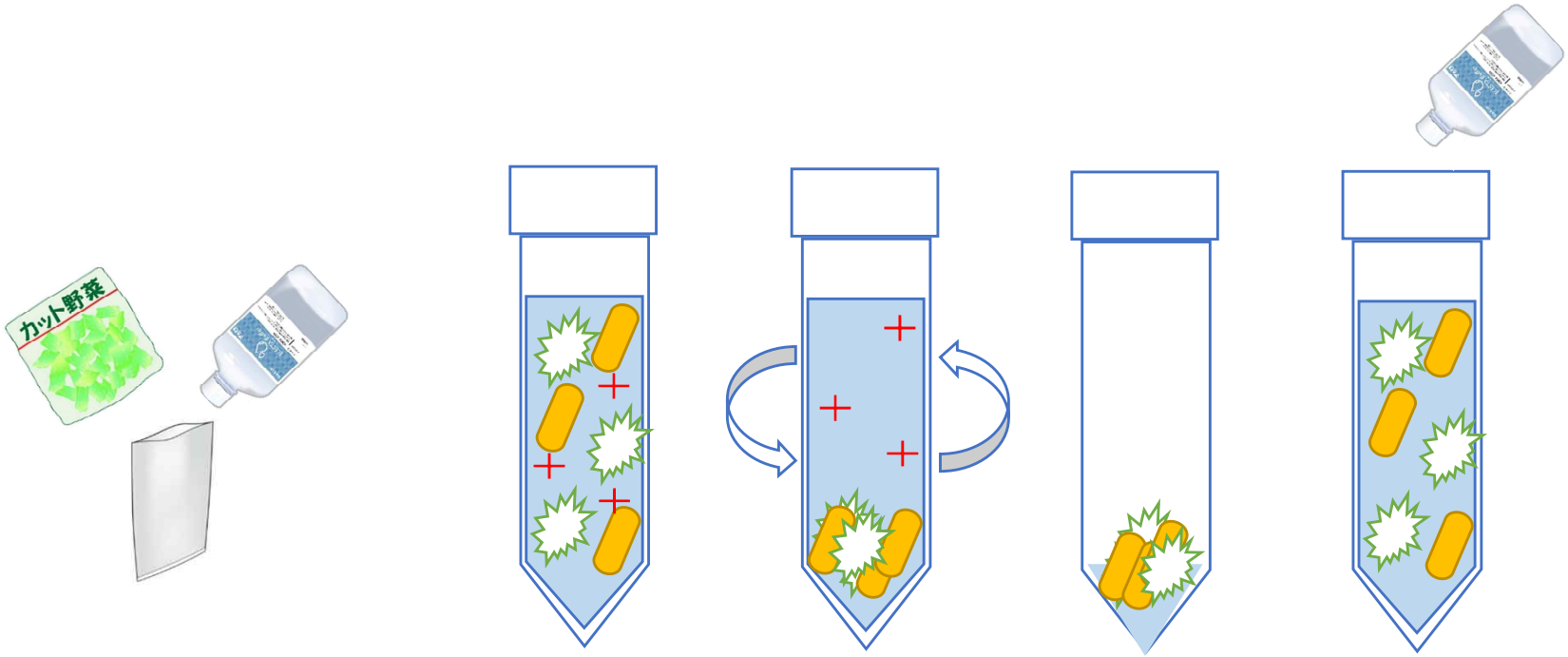
Tips of pretreatment : by sample characteristics 2

For normal solid samples

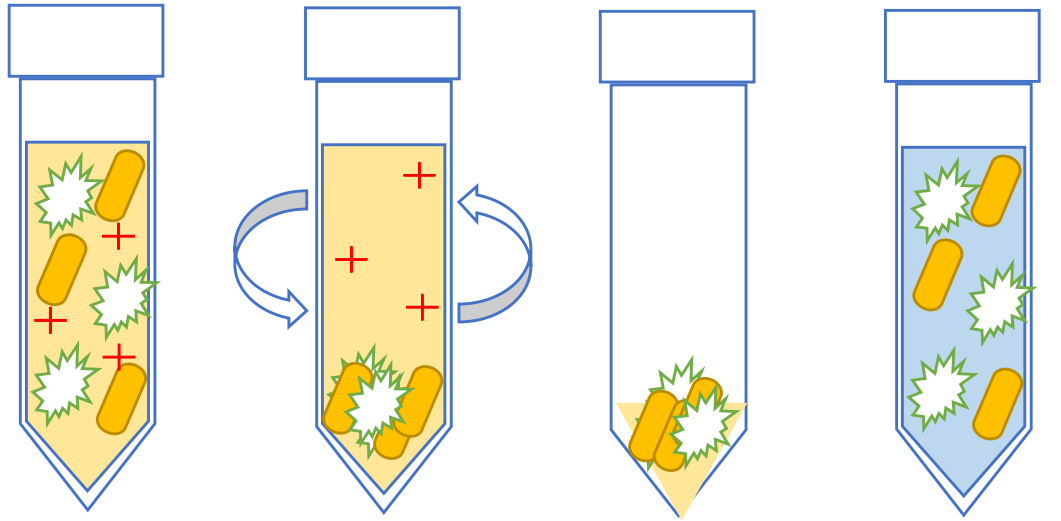
10× dilution → stomaching → high-speed centrifugal replacement



Tips of pretreatment : by sample characteristics 2

For liquid samples

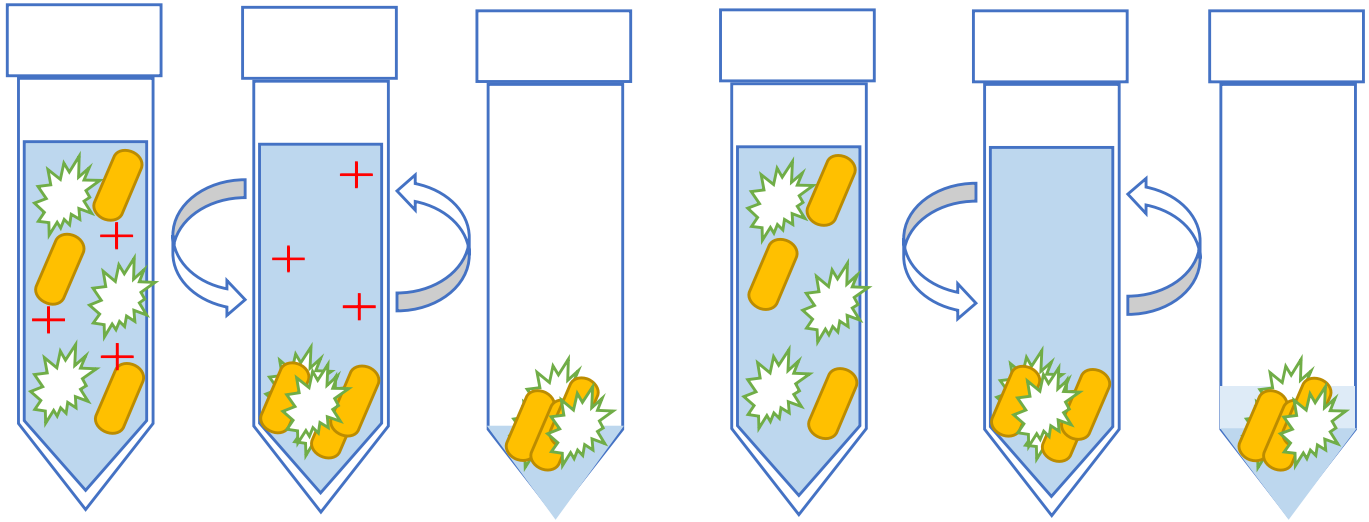
high-speed centrifugal replacement



Tips of pretreatment : by sample characteristics 2

For water samples to check sterility

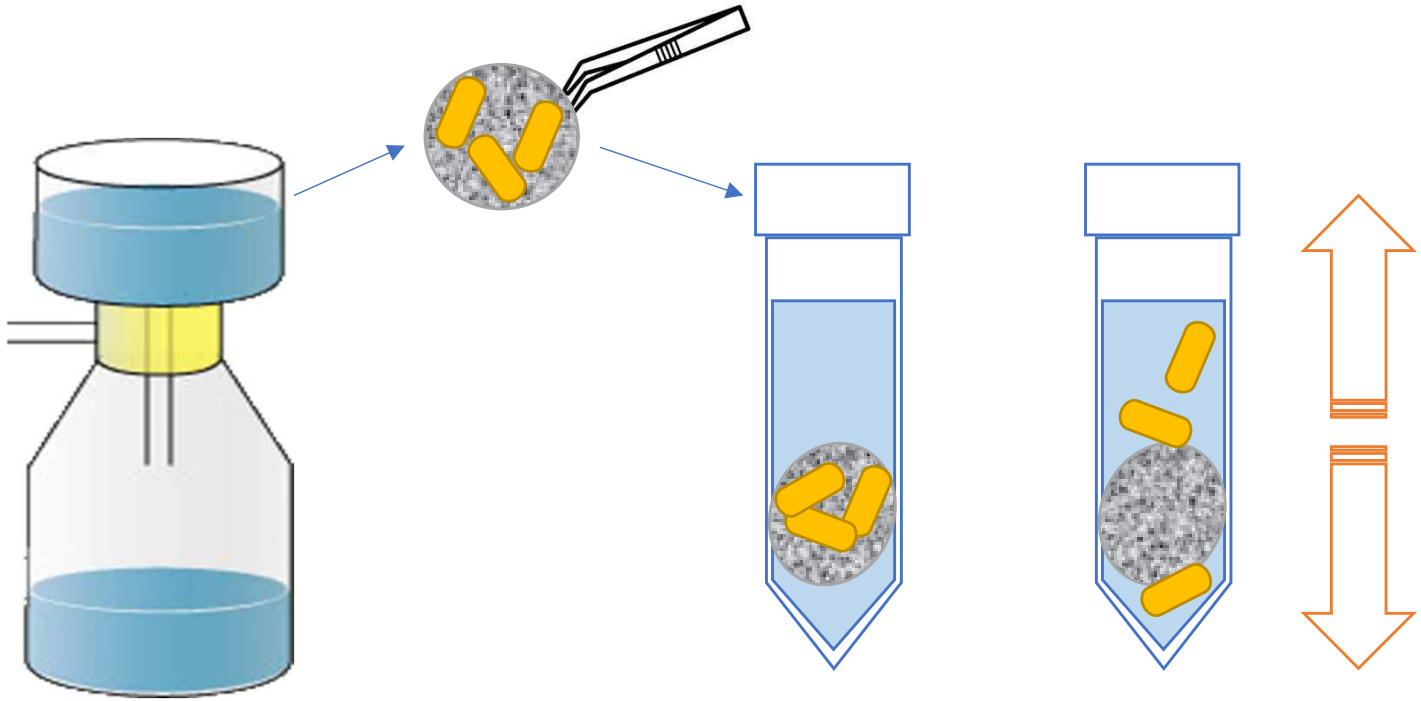
10× concentration → high-speed centrifugal replacement



Tips of pretreatment : by sample characteristics 3

For large volume liquid samples

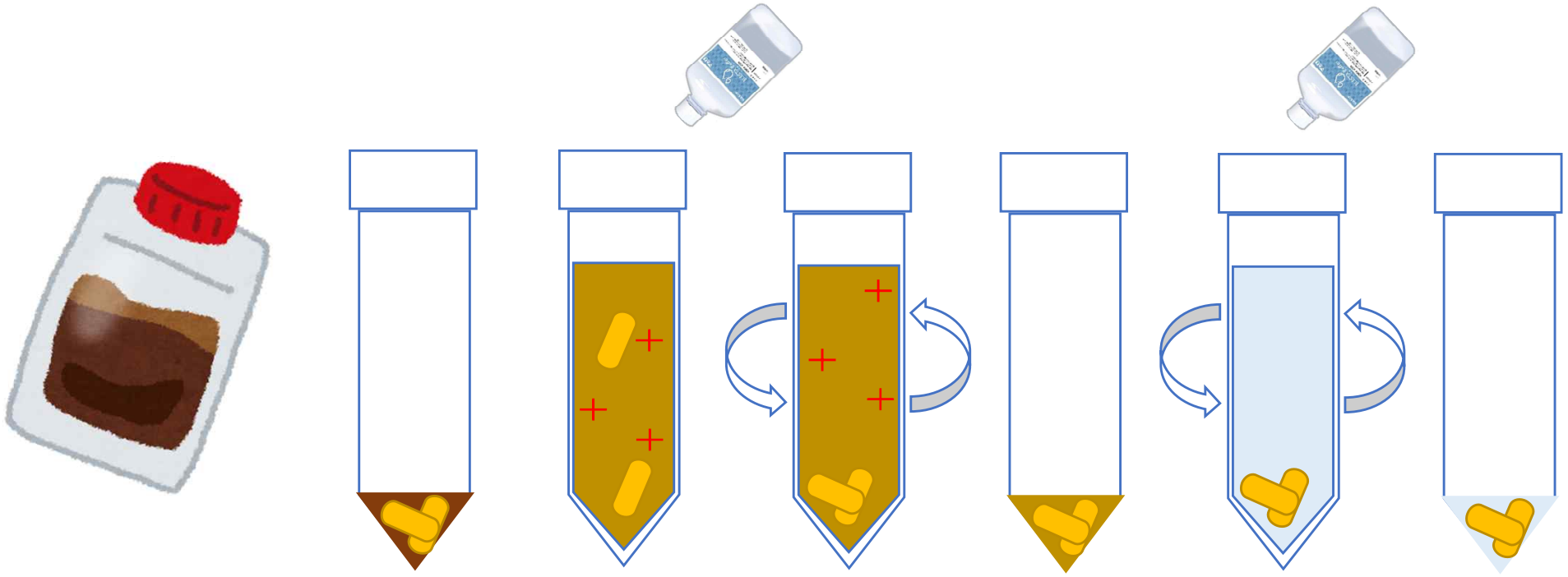
Polycarbonate ϕ0.45Micro Filtration enrichment→ Rinse with 20ml buffer in 50ml tube



Tips of pretreatment : by sample characteristics 3

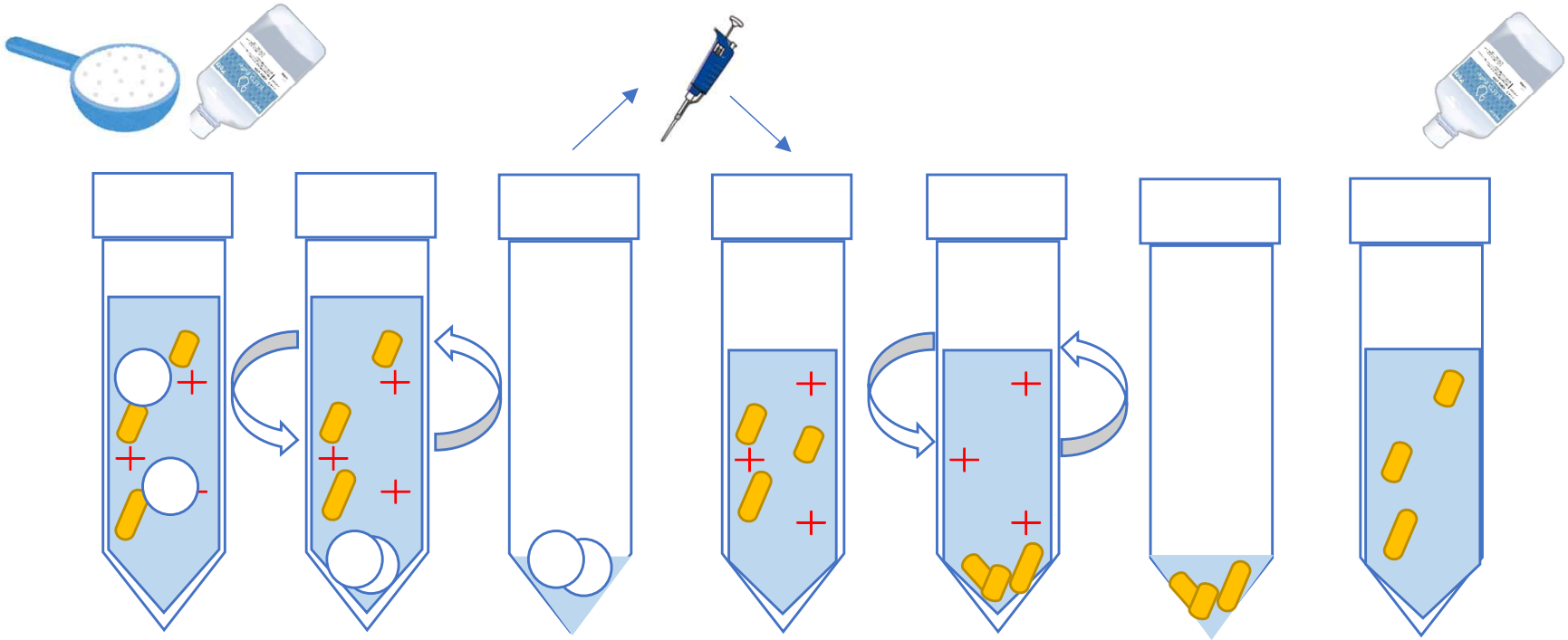
For high viscous samples

Dilution → high-speed centrifugation supernatant replacement



Tips of pretreatment : by sample characteristics 3

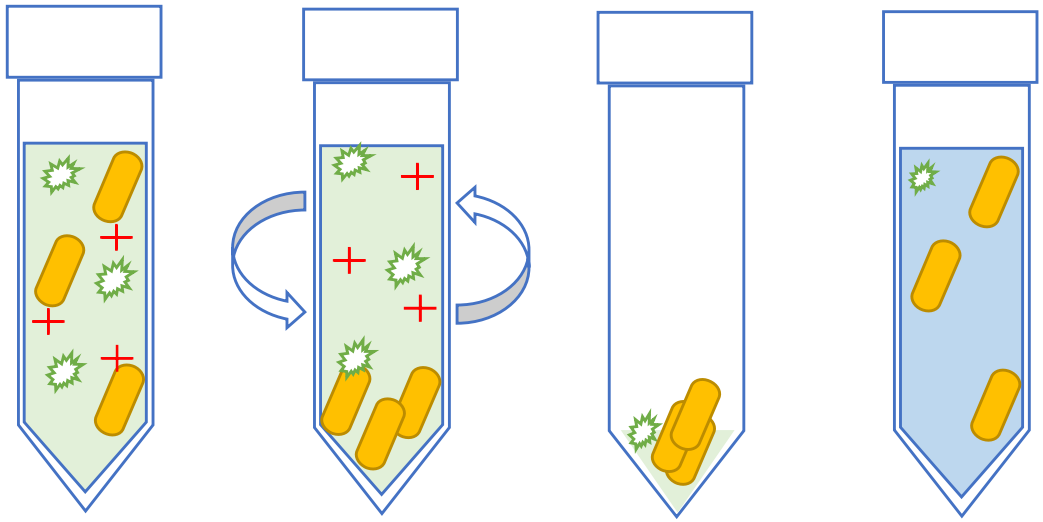
For samples with large particles



Tips of pretreatment : by sample characteristics 3

Low density(lightweight) particle sample

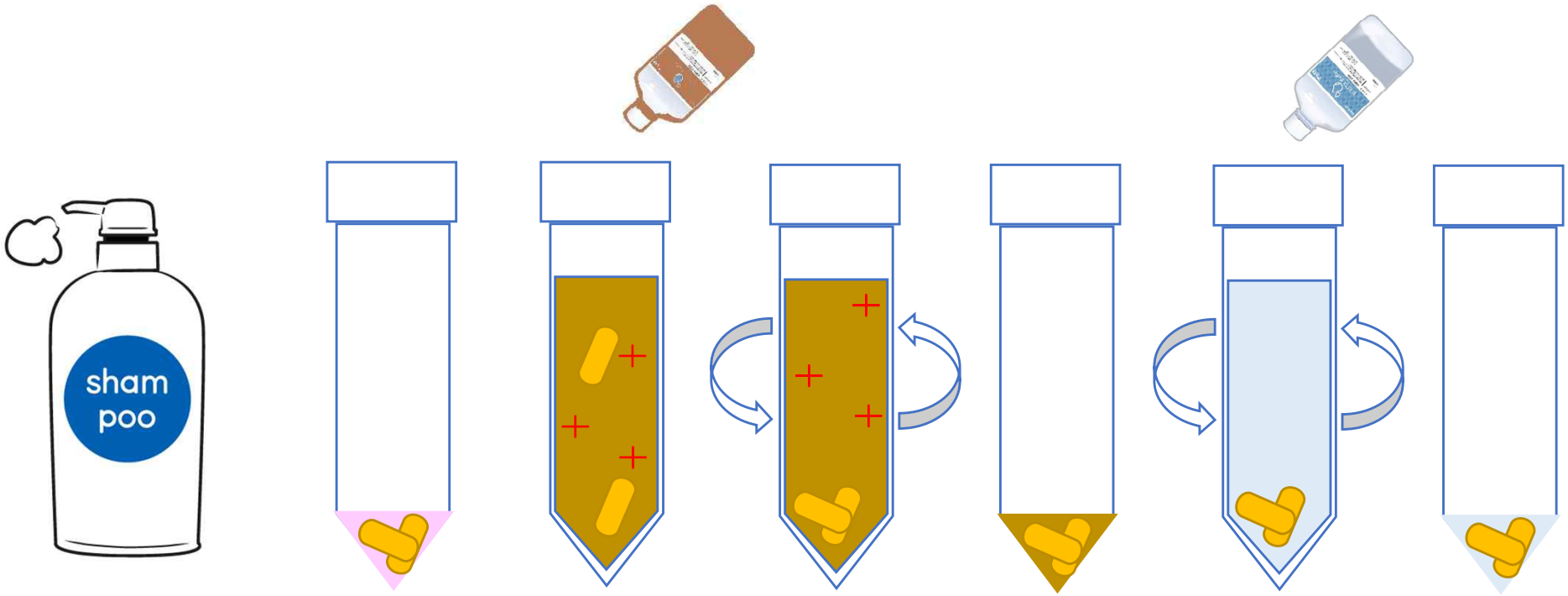
Middle speed centrifugal displacement



Tips of pretreatment : by sample characteristics 3

Antibacterial sample

Use a dedicated inactivating agent or X10-X30 dilution in liquid medium→high speed centrifugal displacement

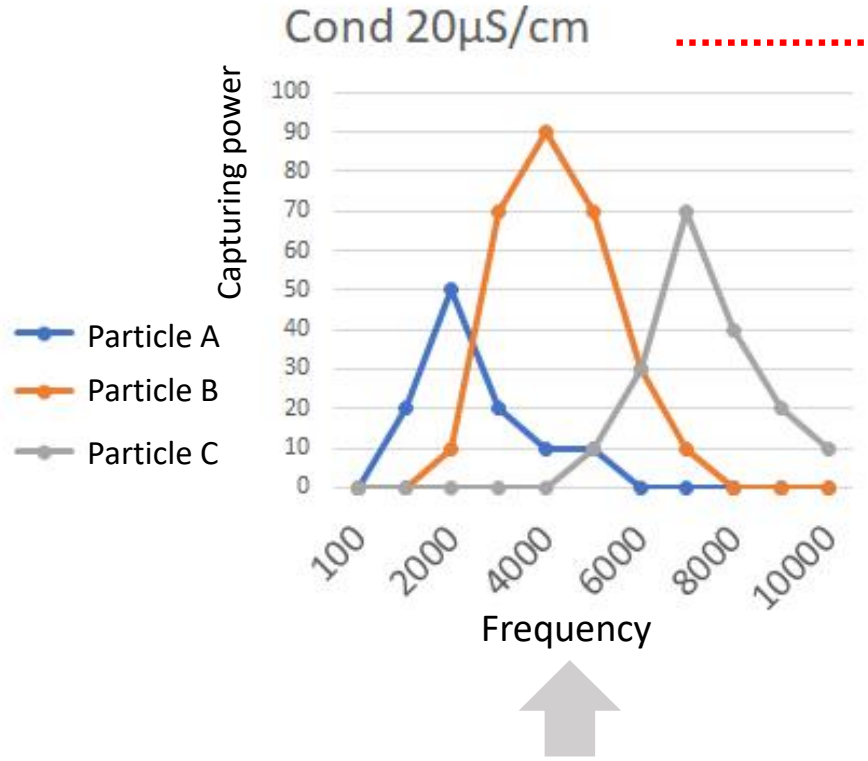


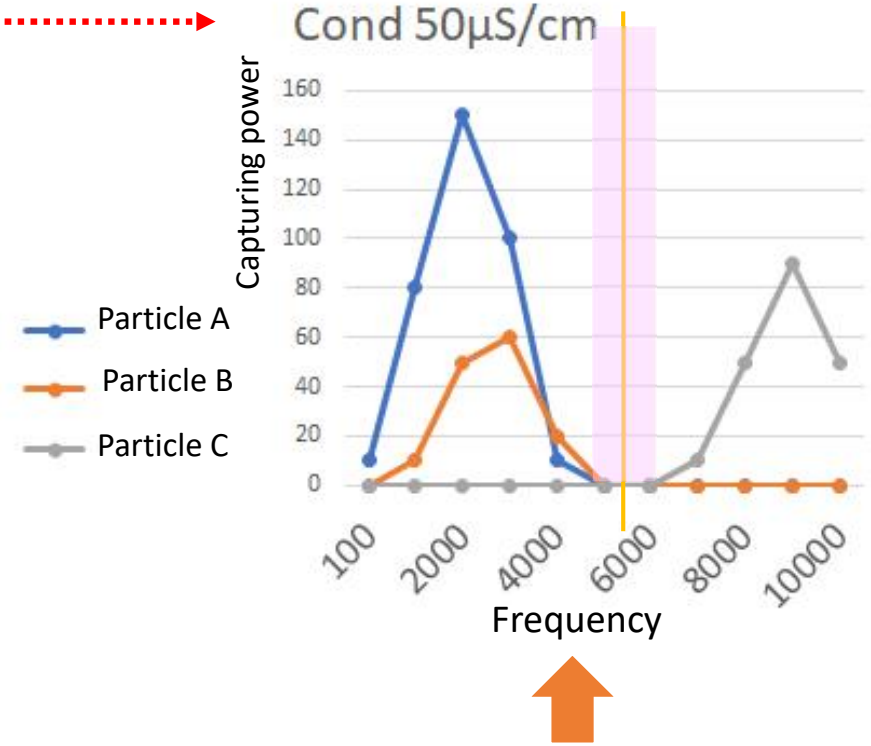
How to determine separation conditions (1)

Frequency and Responsive Particles

Purpose: Find conditions under which any contaminants do not respond.

Changing the conductivity varies the properties of the responsive particles.





No matter which frequency band is used, any particle respond. ⇒ Microorganisms cannot be separated.

Using 5000-6000 kHz, none of the particles respond.
⇒ Only live microorganisms can be separated

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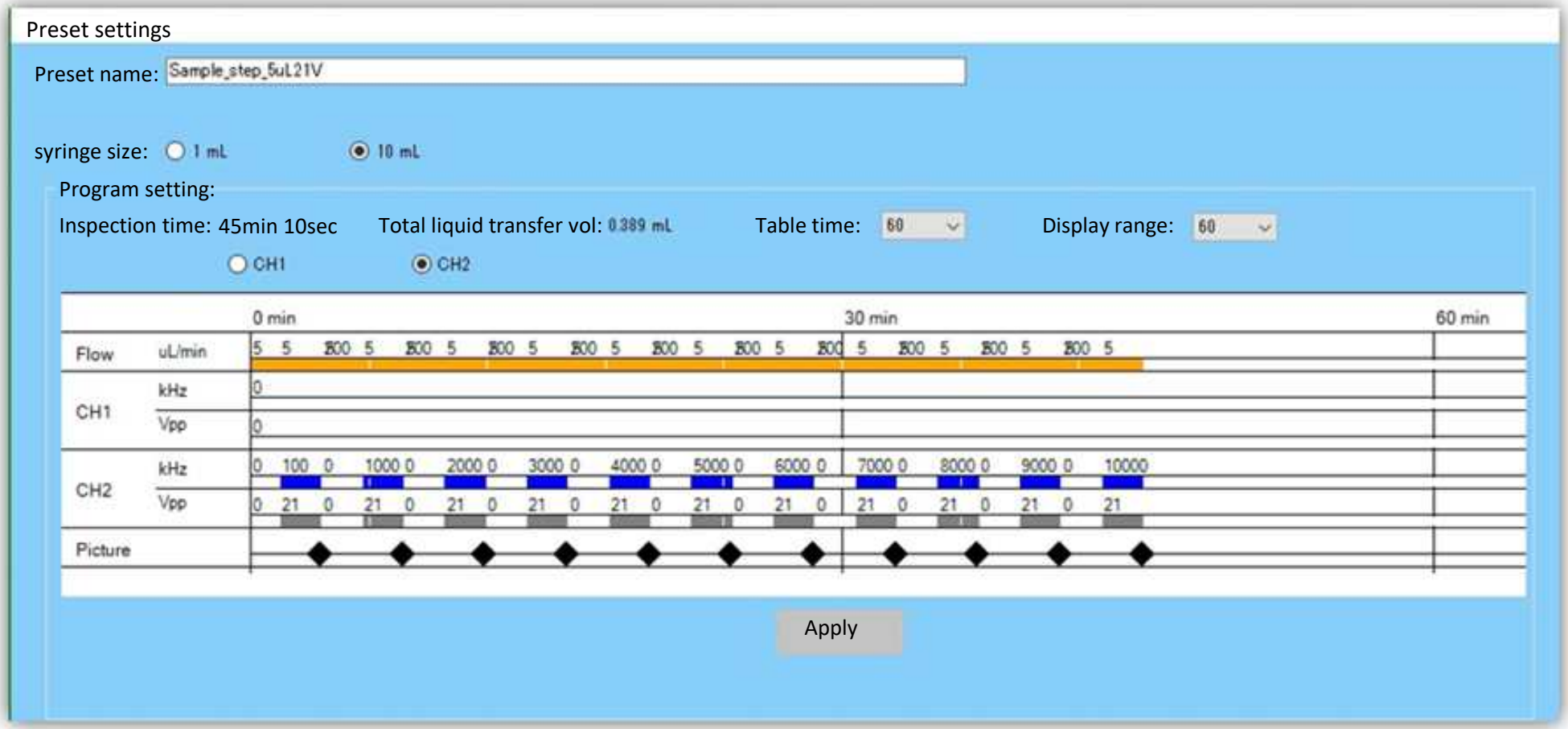
How to determine separation conditions (2)

Relationship between Frequency and Conductivity

Purpose: Find conditions under which any contaminants do not respond.



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How to determine separation conditions (3)

Relationship between Frequency and Conductivity

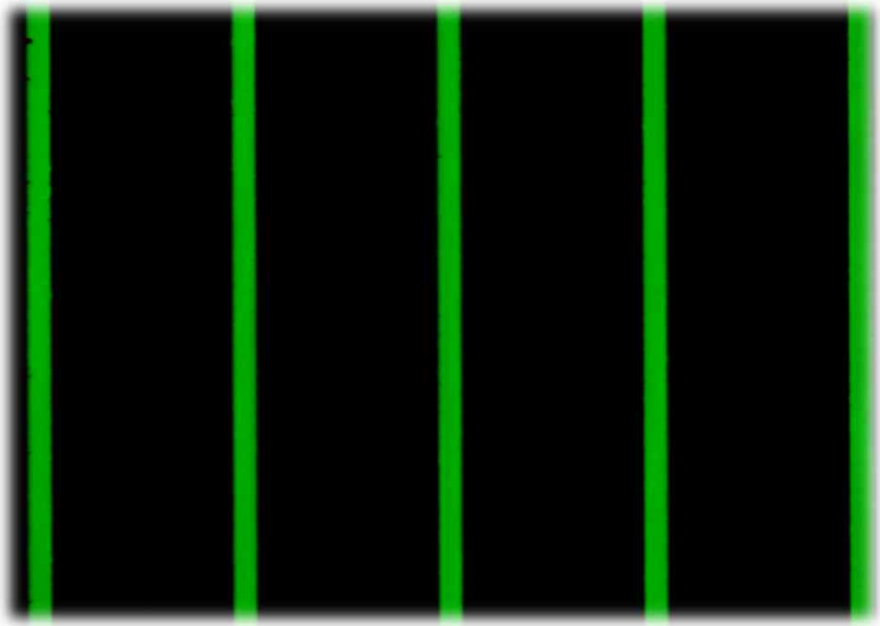
Purpose: Find conditions under which any contaminants do not respond.

Frequency [kHz]	Conductivity [μS/cm]				
	20	30	50	70	100
	Contaminants	Contaminants	Contaminants	Contaminants	Contaminants
100	×	×	×	×	×
1000	×	×	×	×	×
2000	×	×	×	×	×
3000	×	×	×	○	×
4000	×	○	×	◎	×
5000	×	◎	×	○	×
6000	×	×	×	×	×
7000	○	×	×	×	×
8000	○	×	×	×	×
9000	◎	×	×	×	×
10000	×	×	×	×	×

◎ : No contaminant particles are captured at. It can be adopted as an analysis condition.
× : A large amount of contaminant particles are captured. It is unsuitable for analytical conditions.
○ : Contaminant particles are captured slightly. There is a possibility to be adopted as an analysis condition.

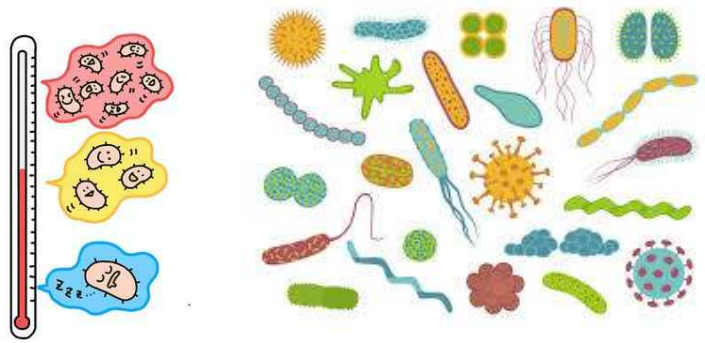
How come what captured are microorganisms?

① it is confirmed that no contaminant particles are attracted under the set conditions.

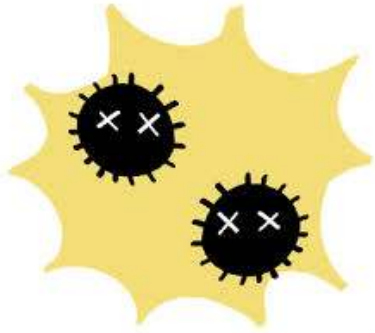


If no conditions are found in which no contaminant particles are attracted, the sample cannot be processed by PixeeMo.

②Place the sample under an accelerated test environment to see if captured particles increase or not



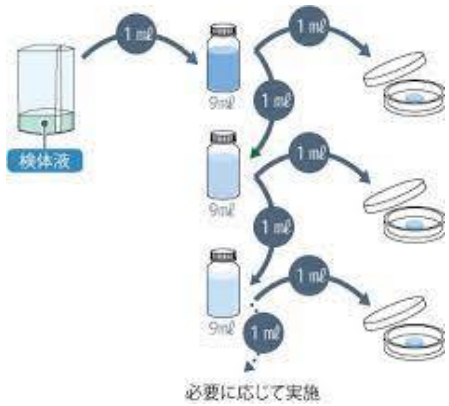
③ Place the sample under sterile environment to see if the number of captured particles decrease or not



AUTOCLAVE

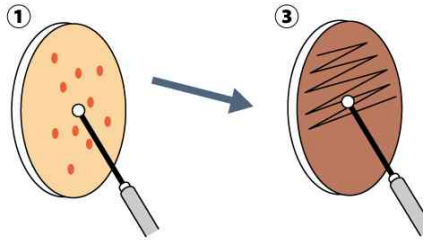
C&T International

Precise and stable results only come from correct understanding of principles and correct operation (1)

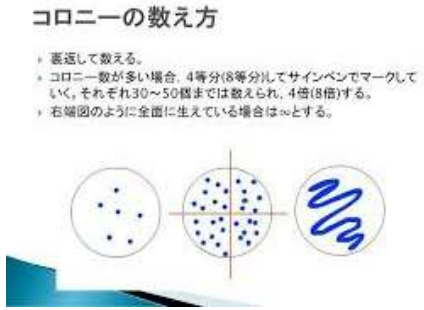


Sample prep, serial dilution

Medium prep/Mixing



Bacteria extracting and streak smear



Colony count and Identification

Experience in student days

Accumulate experience, skill, knowledge

Now：Precise & Stable Result

C&T International

Precise and stable results only come from correct understanding of principles and correct operation (2)

Judge from only 1-2 times test result ?

Judge from comparing with correlation of single culture test result ?

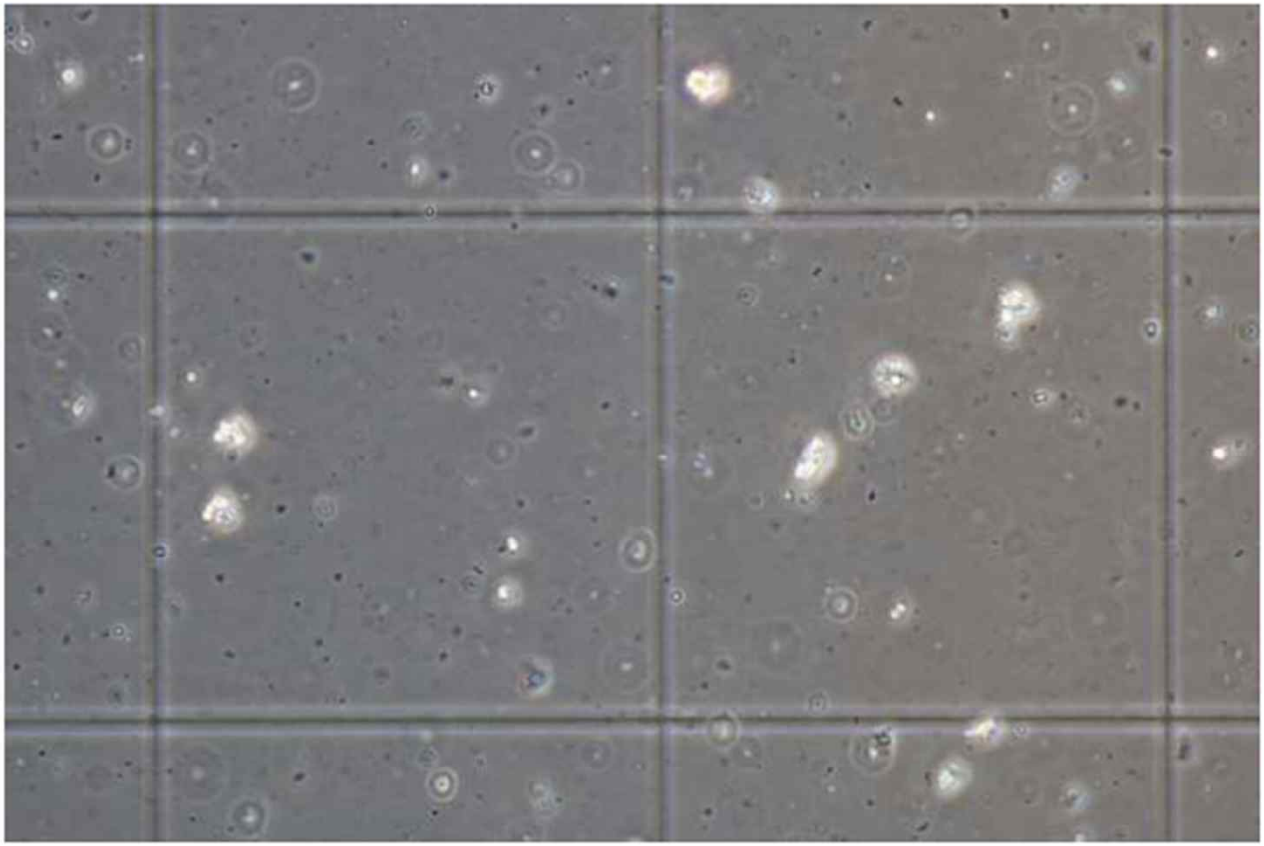
No need to learn any test skills ?

Are there any microorganisms that do not grow in culture?

- Knowledge and skills are required for pretreatment and measurement for any analysis equipment such as HPLC and GCMS. It is important to understand and learn how to achieve the desired results stably.
- The results do not necessarily match the culture method, suitability for the purpose is the top priority.

Cooked rice observation

◇Microscopic observation (confirm the number of component particles with a bacteria counter)　X100 diluted sample



・Number of particle is about 1.9×10^{10} cells/g

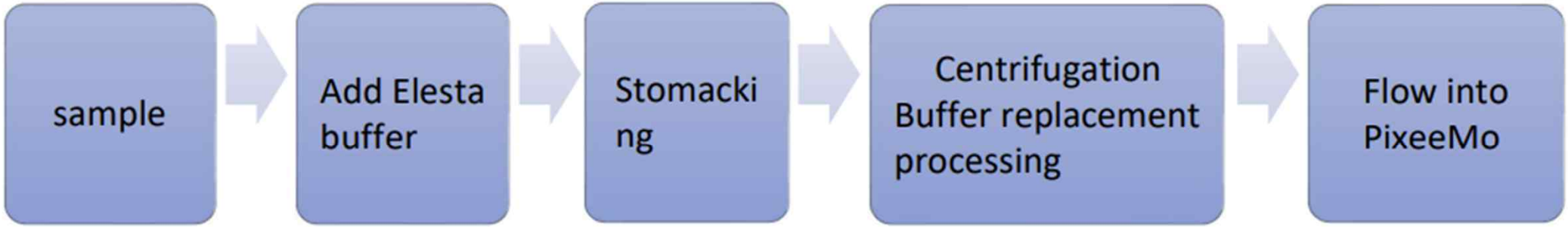
Cooked rice/Sample prep method

◇**Conductivity measurement: x10 diluted by Elesta buffer**：36 μS/cm

◇**Result of culture method**

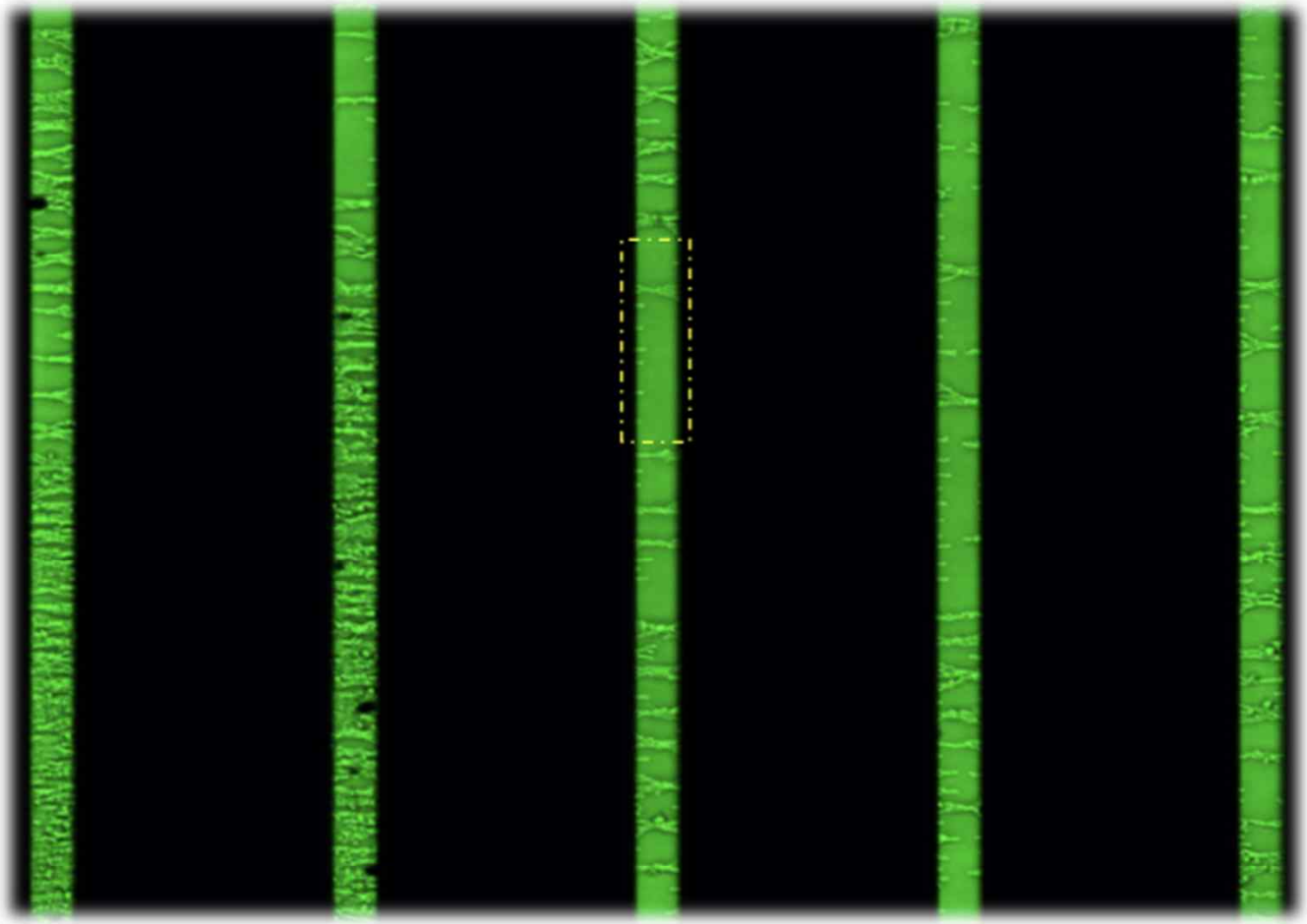
（Standard agar medium、diluted by Elesta buffer and mix、35°C、2 days、aerobic culture）　⇒　4.0×10^6 CFU/g

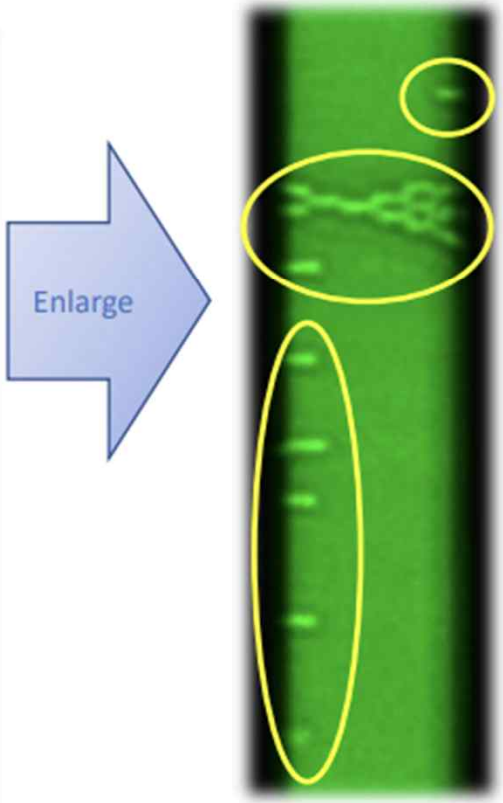
◇**Sample prep for PixeeMo**



PixeeMo result①

◇ PixeeMo image





Existing bacteria

・Bacteria is found 10^5 cells/g and more

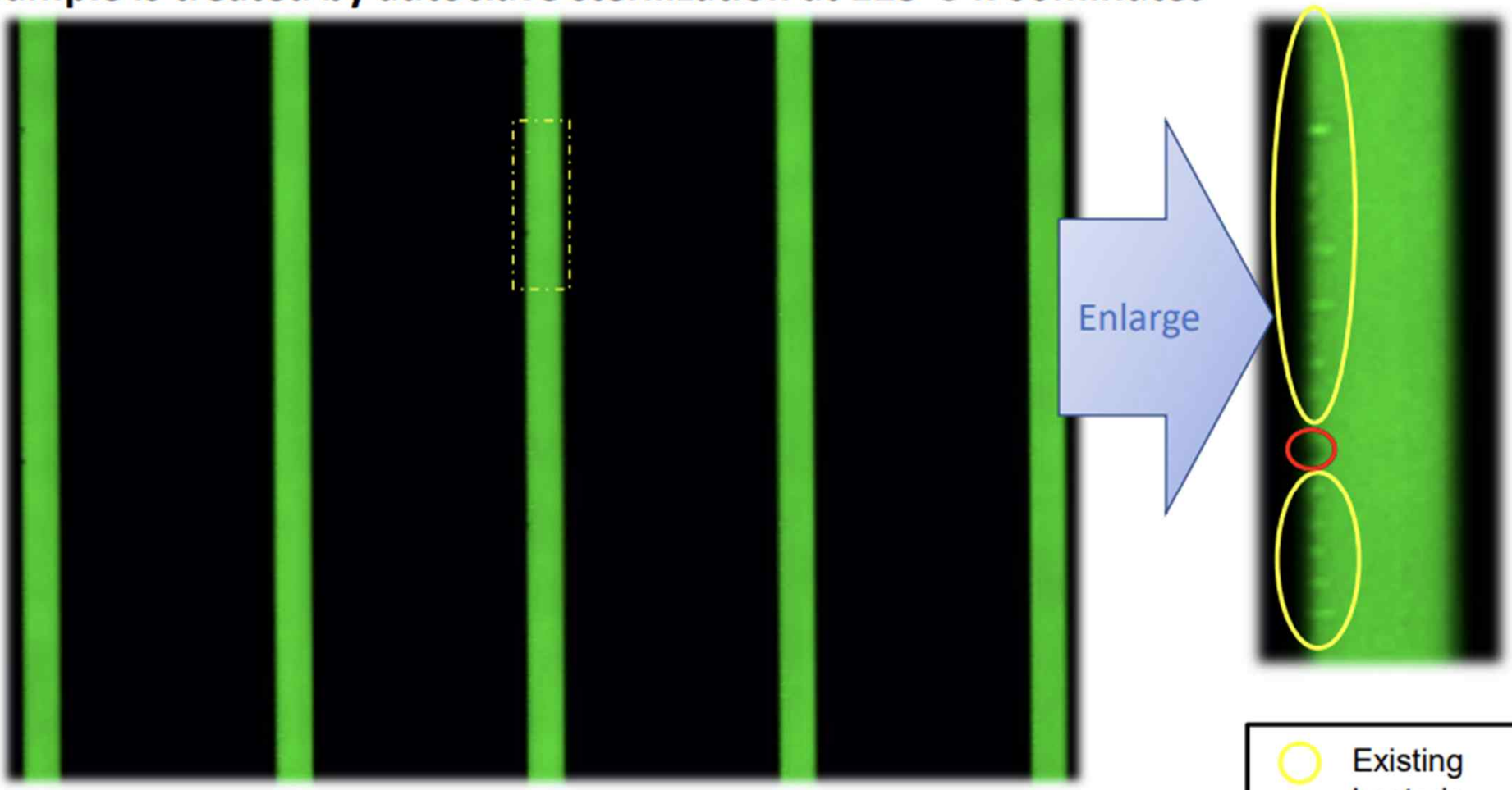
PixeeMo Result ②（sterile sample）

◇Sample is treated by autoclave sterilization at 128℃ x 60minutes

・No microorganisms or other component particles were detected in the autoclaved samples.
・PixeeMo can be applied to the sample. Please consider proceeding to protocol optimization test.

PixeeMo Result ②（sterile sample）

◇Sample is treated by autoclave sterilization at 128℃ x 60minutes



・The number of bacteria detected was significantly reduced in the autoclaved samples.
・The black particles are microplastic particles derived from testing equipment.

HACCP x PixeeMo can solve various issues

Hazard Analysis H A + **Critical Control Point C C P**

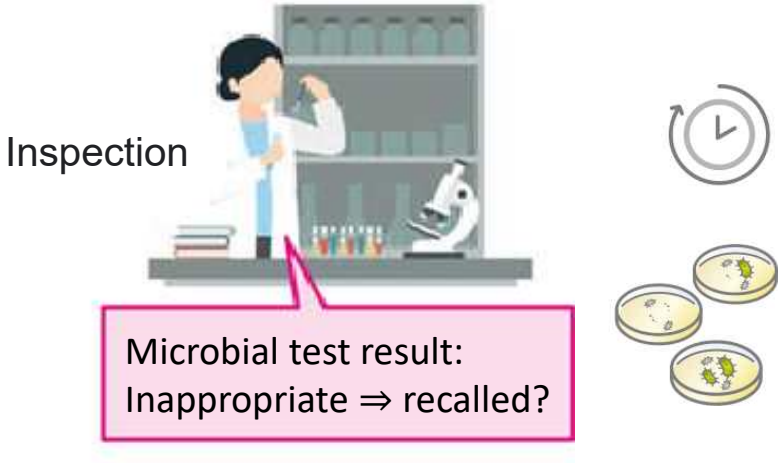
HACCP는 미국의 아폴로 프로그램에서 우주 식품의 안전성을 보장하기 위해 개발된 위생 관리 방법입니다. 그 이후로 음식 산업에서 높은 평가를 받아 전 세계로 확산되어 현재는 국제적인 위생 관리 방법으로 사용되고 있습니다. "HACCP"의 의미는 "Hazard, Analysis, Critical, Control, Point"의 앞 글자를 따온 합성어입니다.
우리나라는 1995년 12월 29일 식품위생법에 HACCP제도를 도입하여 식품의 안전성 확보, 식품업체의 자율적이고 과학적 위생관리 방식의 정착과 국제기준 및 규격과의 조화를 도모하고자 식품위생법 제 32조에 위해요소중점관리기준에 대한 조항을 신설하였다.

해썹 의무적용 품목 7종
비가열 음료, 빙과류, 냉동 수산식품 (어류·연체류·조미가공품), 냉동식품 (피자류·만두류·면류), 어묵류, 레토르트 식품, 배추김치

Conventional method vs Monitoring with PixeeMo

Conventional method

Inspection object: final product (sampling)



Respond to problems encountered in the final product

- Unable to ship for more than 24 hours.
- Safety of all products can't be guaranteed

Monitoring method under HACCP guideline

Inspection object: Raw material, Intermediate produced sample, finished sample, production line, equipment

Check the soundness of the HACCP plan

Detect bacteria risk in real time during every scene of production to prevent the occurrence of abnormality.

- Detect anomalies in real time, before commercialization
- Minimize production loss

C&T International

Hygiene indicator bacterial test vs Live microorganism monitoring

Conventional Hygiene indicator bacteria test

General viable count test : 중온에서의 공기균을 중심으로 한 위생 평가 →저온성, 고온성 세균 등의 증식은 감지되지 않을 수 있음

☒대장균군 검사: 제조과정에서의 가열 부족 및 2차 오염 확인 위한 위생 평가 → 대장균군은 대장에서 유래한 세균 외에도 포함됨 → Deoxycholate Agar 배지법은 국제 검증기관의 타당성 평가에 미치지 못함.

☒대장균 검사: 제조과정에서의 가열 부족 및 2차 오염 확인 위한 위생 평가 →식중독을 일으키는 세균의 대표적 지표균인 대장균을 검출하여 오염 정도를 판정 → 대장균은 비교적 수명이 짧기 때문에 검출되지 않았다고 해서 오염이 없었다고 단정할 수 없음

24시간 이상에 대한 이상은 감지할 수 없으며, 검사 결과를 얻은 후에 모든 제품의 안전이 보장. 하지만 단정 할 수 없음.

Hygiene indicator bacterial test vs Live microorganism monitoring

Live bacteria monitoring by PixeeMo under HACCP plan

☒모든 미생물 모니터링 : HACCP 계획의 건전성 실시간 모니터링

→대상은 저, 중, 고온세균에 관계없이 생존 가능한 미생물 또는 균류의 총 수.

→ 중간 조성, 배양 온도, 배양 시간 등 배양 조건에 영향을 받지 않습니다.

→ 공정의 이상 여부는 총 생균 수를 파악하고 모니터링하여 즉시 감지할 수 있습니다

→ 가열 불량이나 2차 오염의 경우 생존 가능한 세균의 총 수가 증가하므로

즉시 탐지 가능.

→ 대장균 등 식중독 지표균만 늘어나는 것은 현실적으로 불가.

→ 극소수의 식중독 지표균만을 관찰하여 이상을 발견하기는 어렵지만,

생존 가능한 총 박테리아 수를 정량적으로 모니터링하면 이상 징후를 쉽게 감지할 수 있습니다.

제품 출하 전에 열 처리 부족 및 이차 오염과 같은 이상요인을 즉시 감지가 가능.
비정상적인 제품 출하를 예방하고 생산 손실을 최소화할 수 있습니다.

Production management under HACCP plan

①Necessity of bacteria examination …

To verify the sanity of production management

②As inspection object …

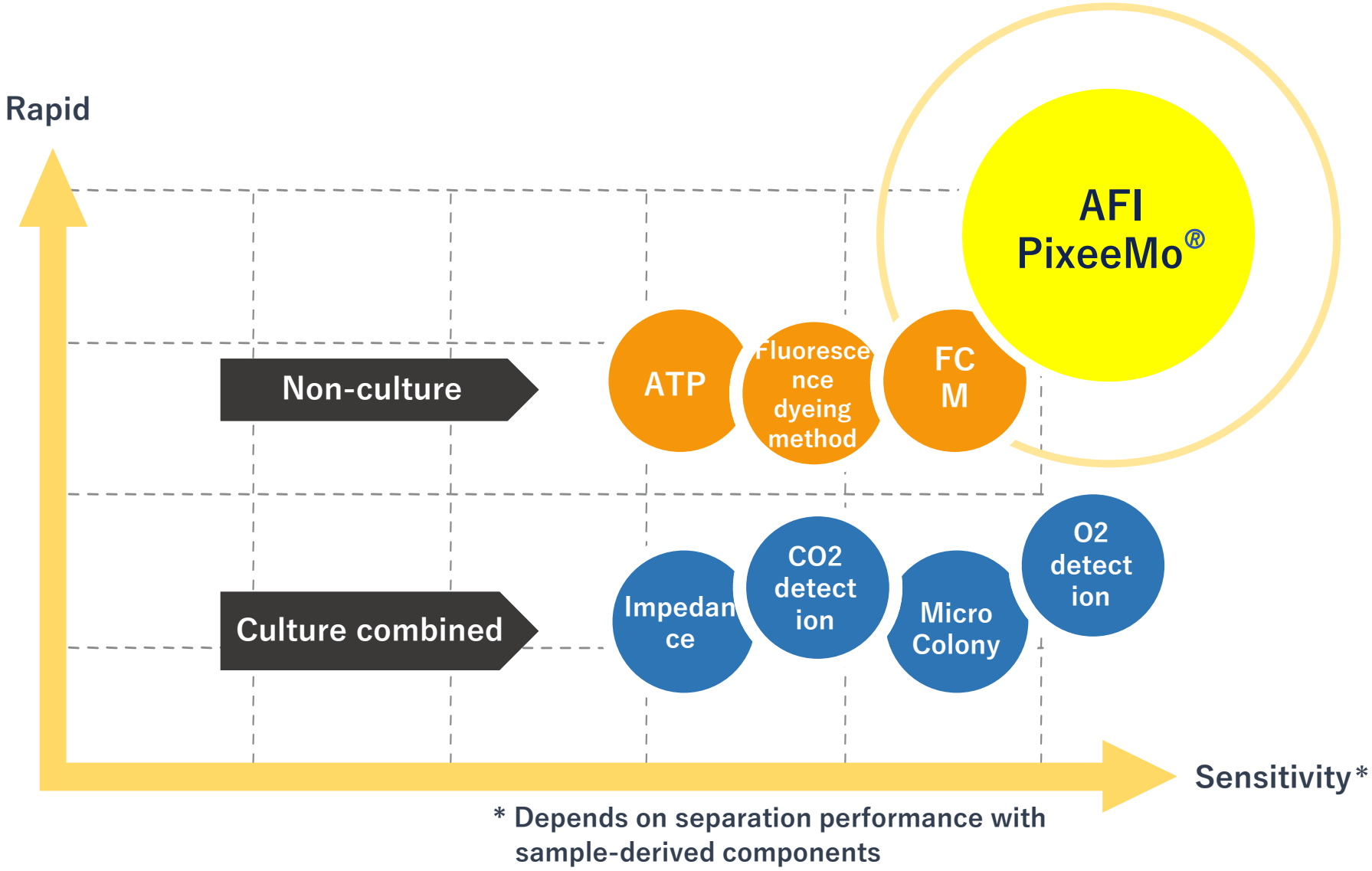
Viable microorganism / Monitor hygiene indicator bacteria levels

③Test method should be adopted …

“validated” test methods with scientific basis

Rapid and simple method suitable for each test purpose

Which method is suitable for viable bacteria monitoring in various method?(1)



Which method is suitable for viable bacteria monitoring in various method?(2)

Comparison of features of main methods

Type	Method
Non-culture	AFI（PixeeMo®）
	Fluorescence dying method
	*ATP
	Flow cytometry method
Culture combined	Micro colony method
	Impedance method
	Oxygen detection
	CO2 detection
Culture	Agar or Liquid medium
	Film medium

Features

- 단시간 내 검사가 가능합니다(5~60분). • 미생물 배양 과정에 영향을 받지 않는 비배양 방법을 사용합니다. • 생존 미생물 모니터링이 가능합니다(ATP 방법은 적용 불가능합니다).

- 긴 시간이 소요됩니다(적어도 8시간 이상 소요)
- 일부 장비는 동시에 여러 샘플을 테스트할 수 있습니다.

- 적어도 24시간 이상 소요됩니다.
- 대상 박테리아에 따라 다른 배양 방법을 사용합니다.
- 저농도의 박테리아를 감지할 수 있습니다.

Current Status of Rapid Microbial Testing Methods

-Why is PixeeMo needed?-

Which method is suitable for viable bacteria monitoring in various method?(3)

ATP method	Flow cytometry method
➢ ATP는 미생물 내에 존재하는 분자로 추출하여 측정하지만, 샘플 오염물질에도 ATP가 존재합니다. 따라서 일반적으로 오염의 지표로만 사용할 수 있습니다. 	➢ 샘플 오염물질 제거가 충분하지 않으면 시스템이 막힐 수 있다. ➢ 기본 원리가 형광염색법과 같기 때문에 측정 가능한 샘플이 제한 ➢ 초기 비용이 높다 ($10,000~)" 

Sample components interfere with analysis

Which method is suitable for viable bacteria monitoring in various method?(4)

Fluorescence dying method	PixeeMo® method
・비용 약＄30,000-	・비용 약＄70,000-
・Fungi (molds, yeasts) cannot be detected by some reagents	・Can detect all bacteria, fungi, spores, etc.
・염색 시약에 따라 결과가 달라질 수 있음.	・No need to use dying reagent (Non-invasive)
・채소와 같이 색소를 포함하는 샘플에는 적용할 수 없음.	・Polyphenols and carotenoids contained in vegetables, etc. is possible even dyes are contained
・농축유와 같은 샘플에는 적용할 수 없음.	・Measurement is possible even when dyes like polyphenols and carotenoids contained in vegetables are mixed
・고점도 샘플에는 적용할 수 없음.	・Oil-rich sample can be measured
・Membrane-filter처리가 필요합니다.	・No membrane filter treatment needed
・제품은 제3자 인증 기관에서 인증을 받은 것이 없습니다. 	・AOAC-PTM certified（Drinking water） From a comprehensive point of view, PixeeMo is the best choice for viable microorganism monitoring !! 

Benefits of Introducing PixeeMo

- 원료를 사용하기 전 위생상태 확인 가능
- 살균 공정 전후의 위생 상태를 즉시 확인
- 중간 공정에서 발생하는 이상을 조기에 감지하여 추가 조치를 통해 미수출을 방지.
- wiping inspection등으로 이상 발생 시 원인을 쉽게 조사하고 라인 복원 작업에 대응할 수 있습니다.
- 미생물 검사 실패로 인한 불량 제품의 발생을 크게 줄일 수 있습니다.

Case study(1) Measuring the number of viable bacteria in Mineral Water

Escherichia coli (ATCC 25922)

Spike & Recovery Test

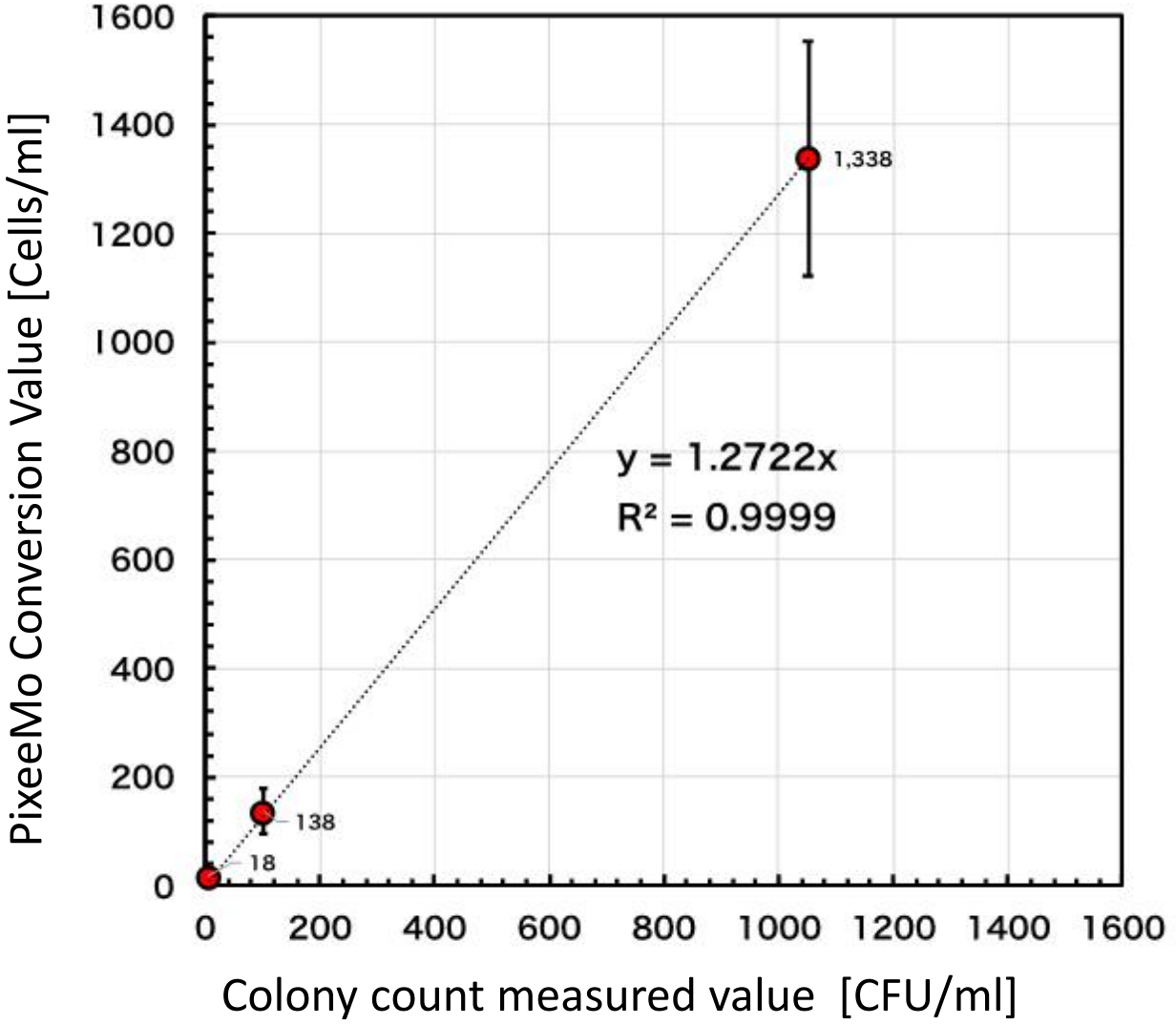
using a Typical Microbial Strain

Pretreatment	25 min
Measurement	15 min

Lower limit value	10^1 cells / mL

* + Centrifugal concentration process

: 10^0 cells / mL



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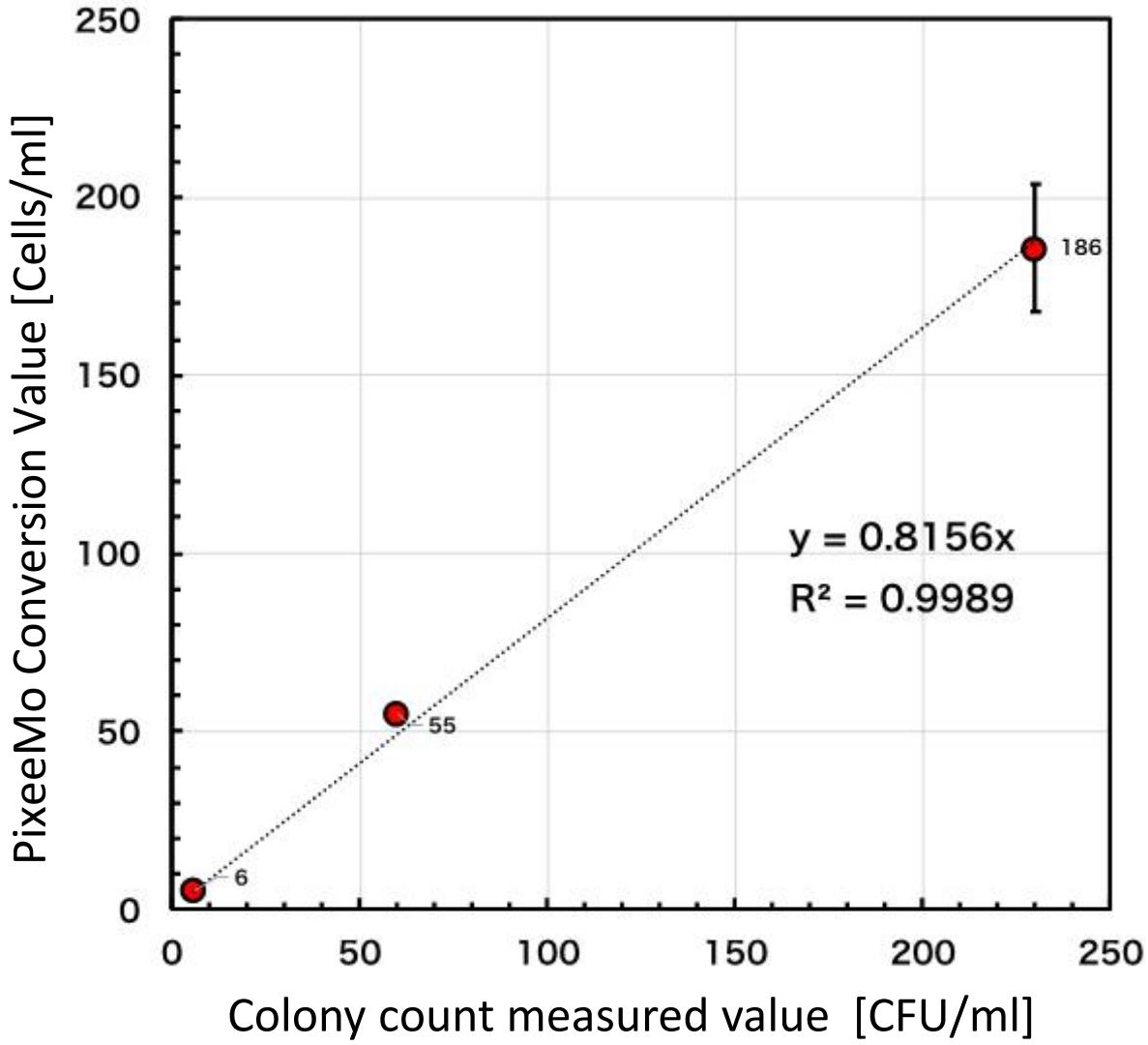
Case study(2) Measuring the number of viable bacteria in Beer

Lactobacillus
Spike & Recovery Test
using a Typical Microbial Strain

Pretreatment	20 min
Measurement	30 min
Lower limit value	10^0 cells / mL



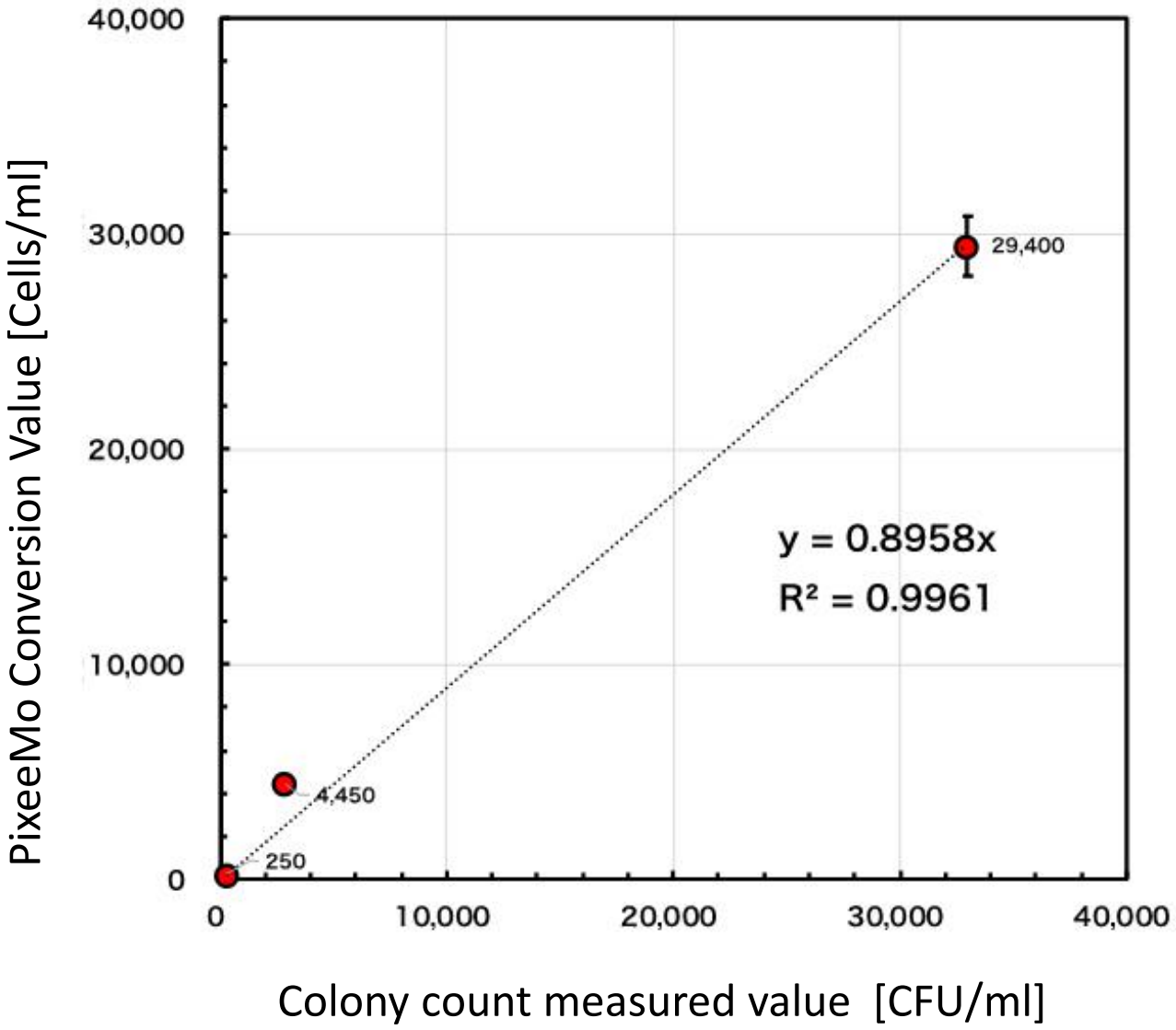
C&T International

Case study(3) Measuring the number of viable bacteria in Processed Meat Product

Lactobacillus

Spike & Recovery Test
using a Typical Microbial Strain

Pretreatment	**22 min**
Measurement	**25 min**
Lower limit value	**10^2 cells / g**

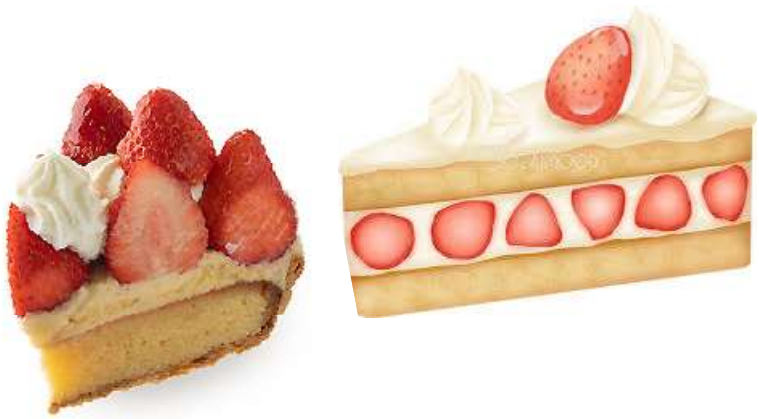


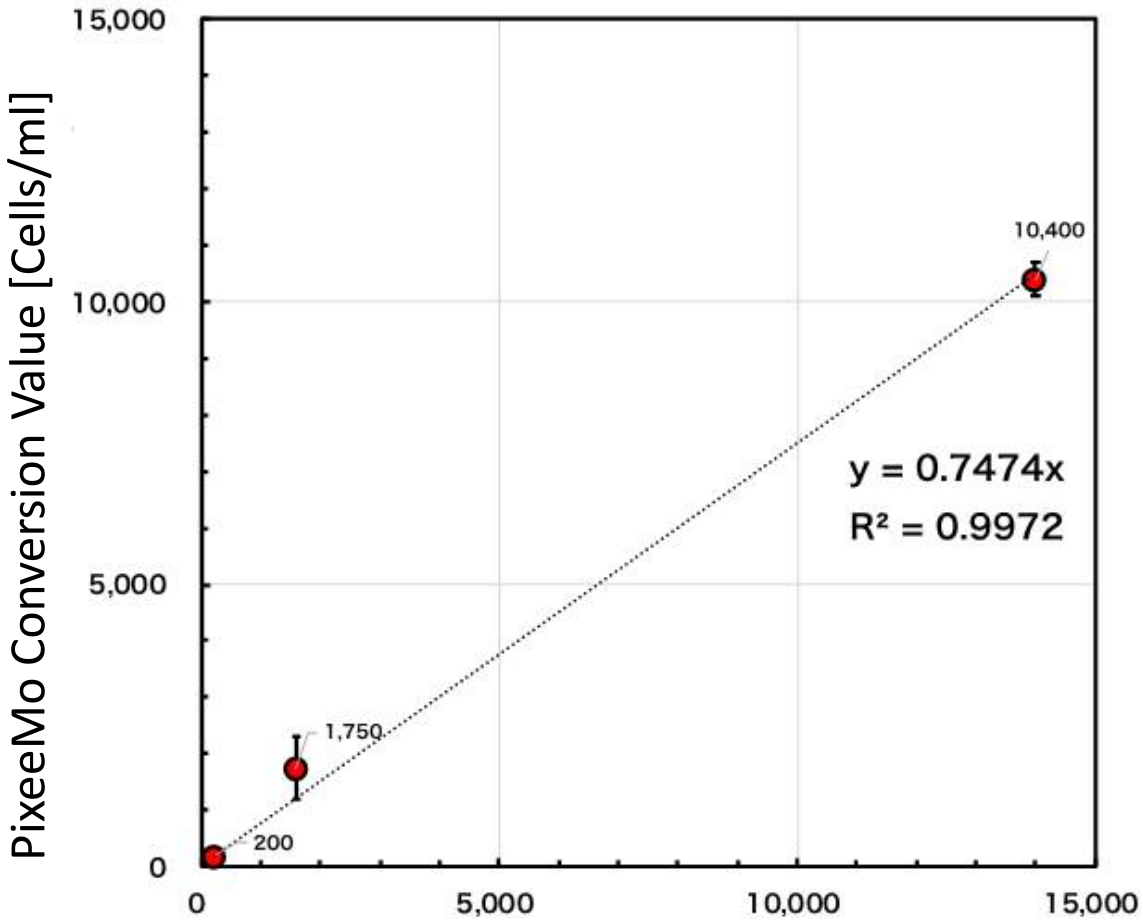
Case study(4) Measuring the number of viable bacteria in Cake

Bacillus cereus

Spike & Recovery Test
using a Typical Microbial Strain

Pretreatment	35 min
Measurement	25 min
Lower limit value	10^2 cells / g





S. morita：*J. Antibact. Antifung. Agents*, Vol. 48, No. 5, pp.221-226(2020)

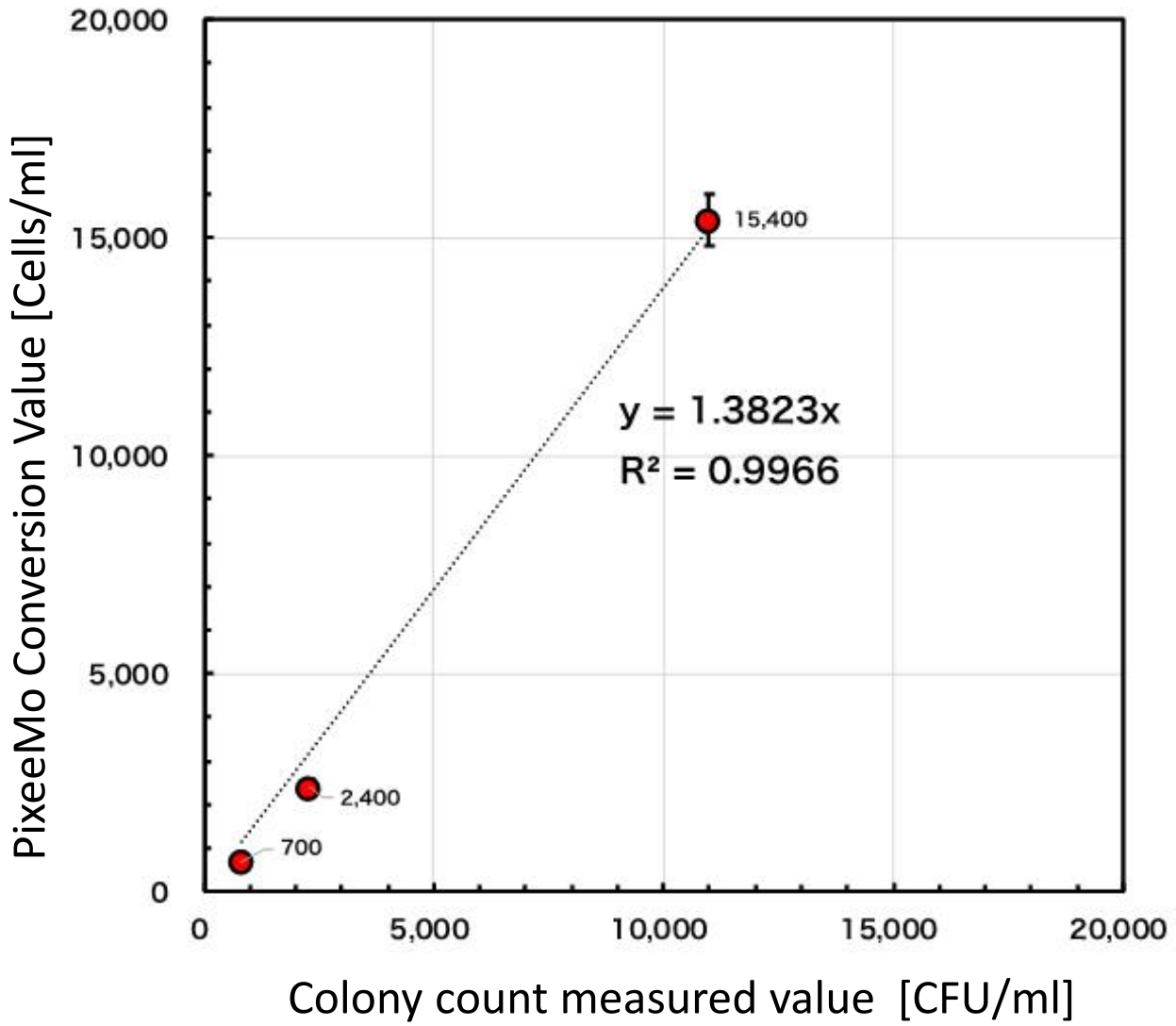
Case study(5) Measuring the number of viable bacteria in cut Vegetable

Pseudomonas

Spike & Recovery Test
using a Typical Microbial Strain

Pretreatment	25 min

Lower limit value	10^2 cells / g



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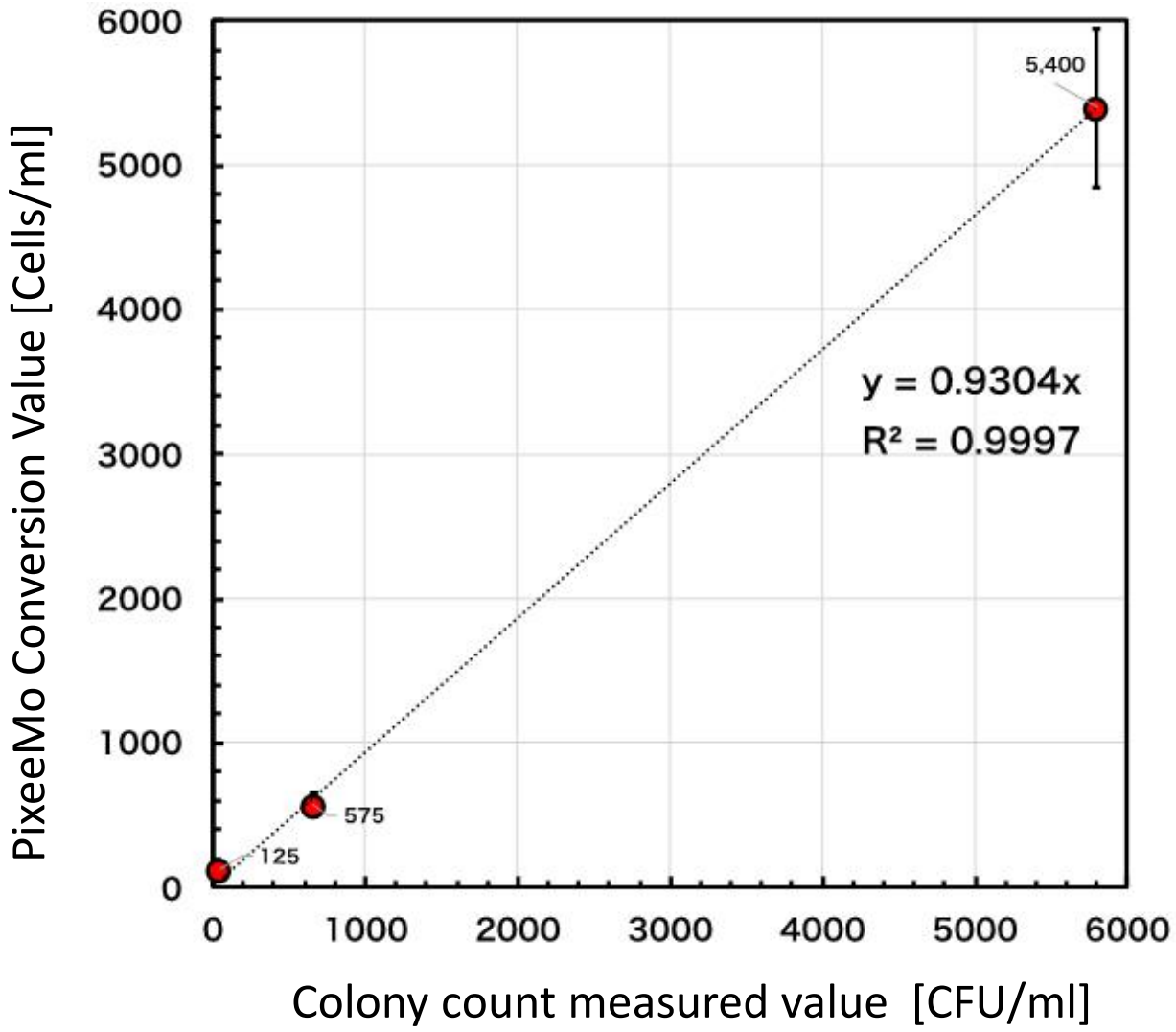
Case study(5) Measuring the number of viable bacteria in Shampoo

Candida albicans

Spike & Recovery Test
using a Typical Microbial Strain

Pretreatment	**60 min**
Measurement	**25 min**
Lower limit value	**10^2 cells / g**



C&T International

Thank you for your attention

Real-time viable microbial monitoring

PixeeMo®

C&T International

Thank you for your attention

Advanced **F**iltration **I**ndustries Technology

地域未来牽引企業

AOAC INTERNATIONAL JAPAN SECTION

J-Startup KANSAI

Basic purchasing process

①Questionnaire

Fill out the questionnaire to understand the current situation.

②Sample provision

Customer provides test request samples.

③Characterization test

Free evaluation to see if the samples can be processed by PixeeMo.

④Confirmation

Based on the results of the characteristic test, confirm the customer's introduction conditions, etc.

⑤Protocol setting

Propose and implement a paid test to establish a protocol to achieve the introduction conditions.

⑥Protocol report

Submit the protocol report that has cleared the introduction conditions.

⑦Demonstration

Conduct an actual machine demonstration based on the established protocol.

⑧Delivery and Installation

Install it with the settings based on the protocol established at the specified location.