

# New quinone analysis

Quinone profile method



- Amount of microorganisms
- Diversity

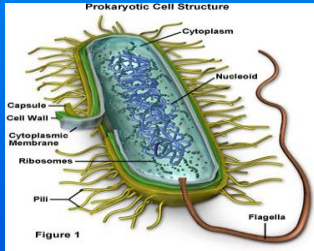


Structure of microbial community

- Activated sludge
- Soil
- Compost
- Waste water



Microorganisms



Extraction

Quinone type

Separation

Quinone qualification, determination



Quinones	Bacteria species
Q-8	<i>Burkholderia, Comamonas, Acinetobacter, Azotobacter, Alcaligenes,</i>
Q-9	<i>Pseudomonas, Hyphomicrobium, Acinetobacter</i>
Q-10	<i>Acidiphilium, Rhodobacter</i>
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MK-8	<i>Aeromonas, Proteus, Lactobacillus, Micrococcus</i>
PQ-9, VK1	<i>Cyanobacteria, Synechococcus</i>

Solvent extraction

SFE with CO<sub>2</sub>

Expansion of application range

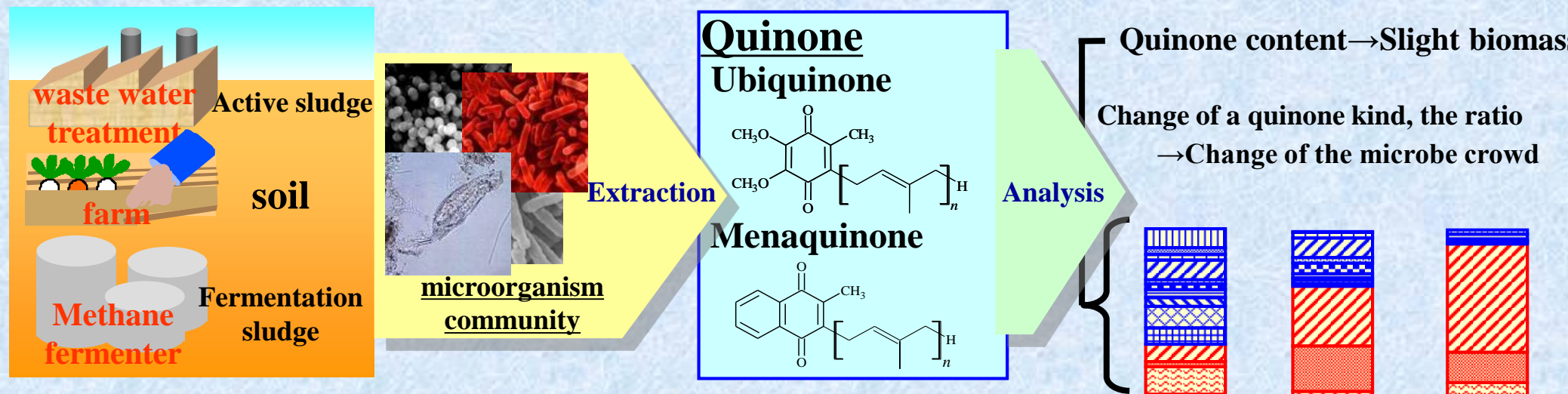


- Quick and easy to operate
- Organic solvent is unnecessary
- Possibility of SFC separation
- Possibility of MS utilization

● Foundation of company on analysis

# Development of online SFE-HPLC for quinone profile method using small volume of sample

## Quinone profiling .....microorganism community analysis method



- general features
- ◆ Isolation, culture is unnecessary
  - ◆ Can understand the change of quantity, the kind of the microbe quantitatively

### Current study in our laboratory

Application of SFE (Supercritical Fluid Extraction)  
Simplication of the analysis pretreatment

Not use chloroform

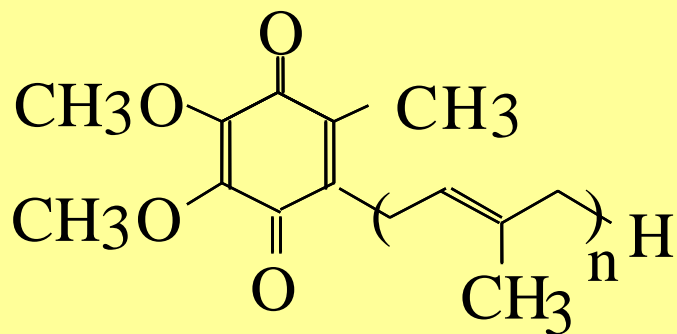
Risk reduction by the erroneous operation

Acceleration of the analysis

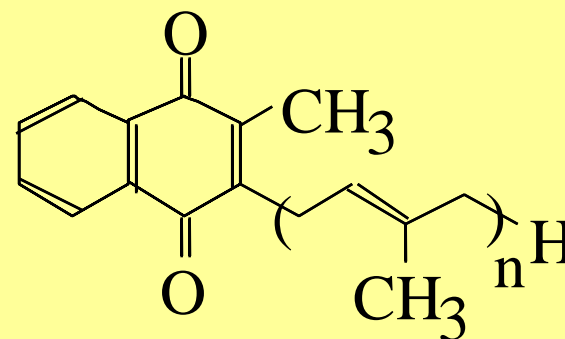
Organic solvent reduction

# Chemical structural formula of quinone

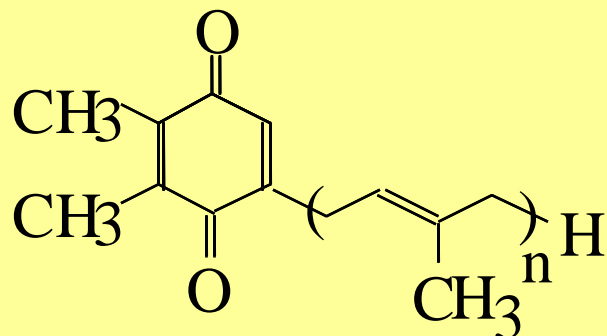
Quinone: Electron transport material in the respiratory chain of the microbe



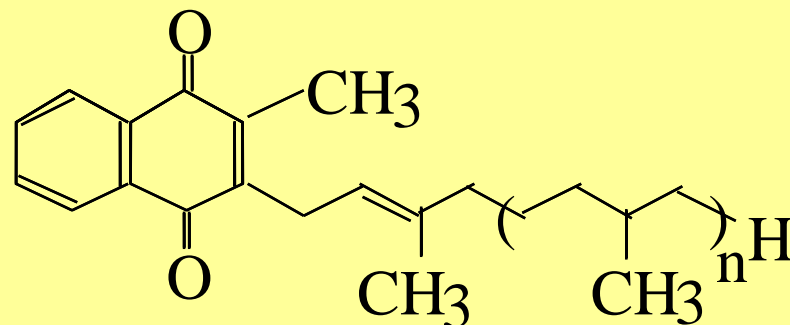
Ubiquinone(UQ-n(Hx))



Menaquinone(MK-n(Hx))

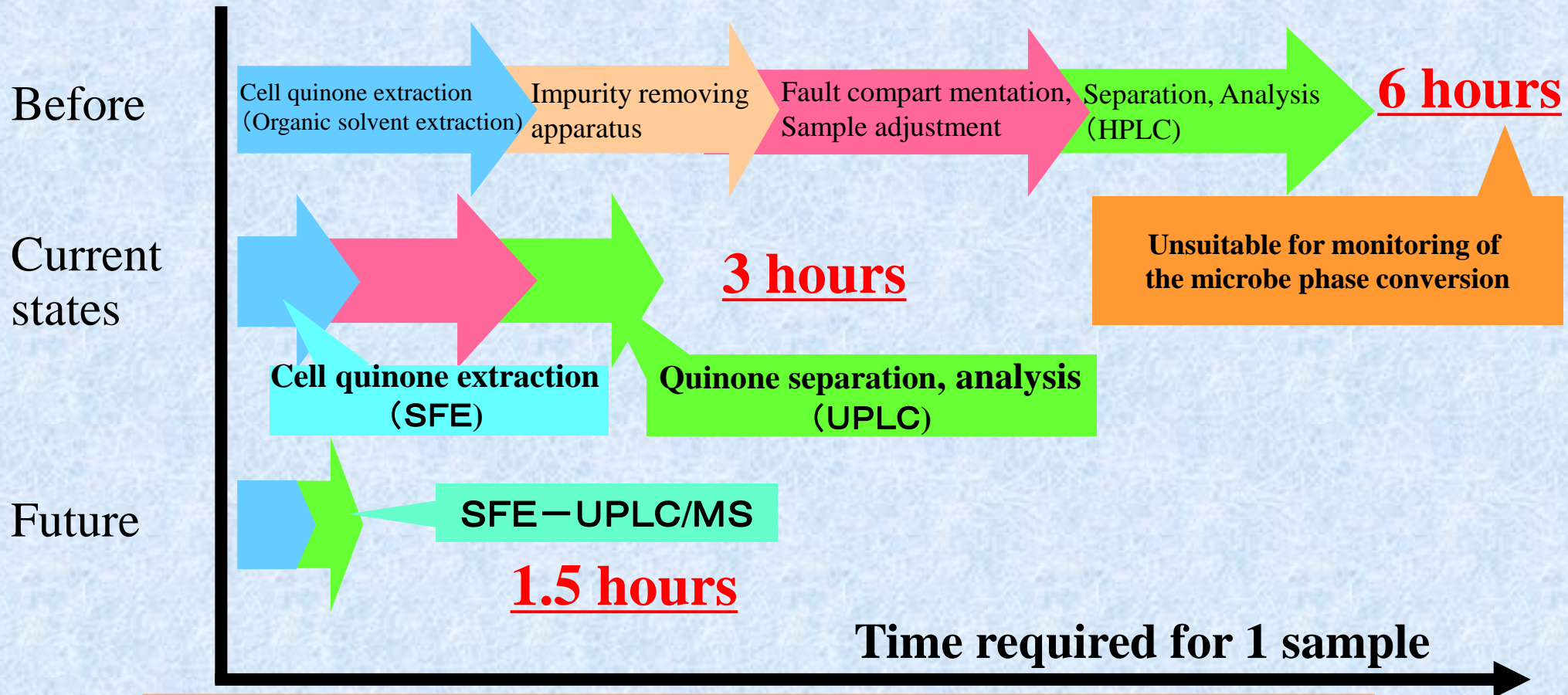


Plastoquinone(PQ-n)



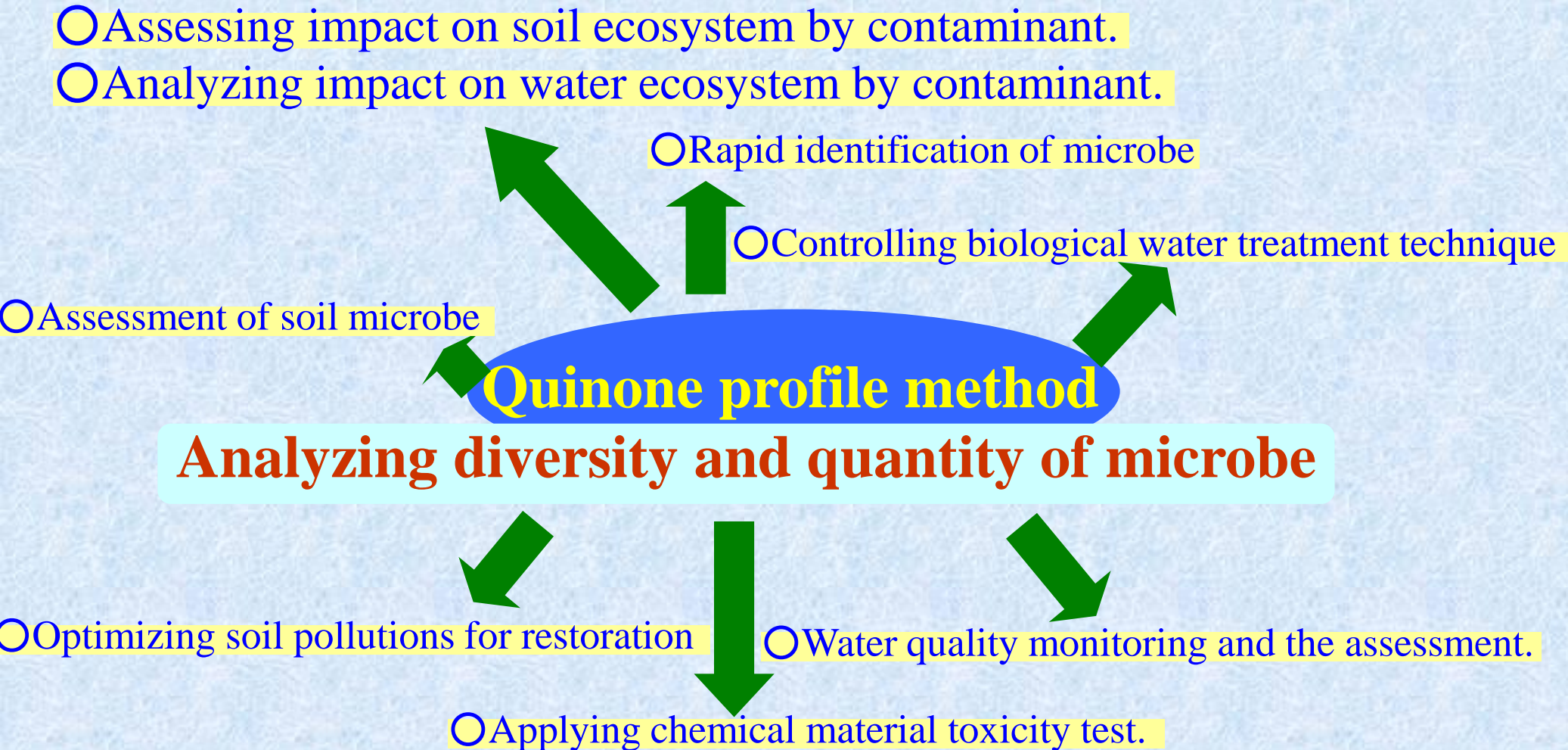
Bitamin(V) K1

# Characteristic of the new quinone profile method



- ★ Can monitor microbe phase conversion easily
- ★ An adaptation range spreads out and is available for an evaluation of various biological system environmental technology
- ★ High separation ability, high sensitivity, no chloroform
- ★ Automation is easy

# Application of microbe phase transition by quinone profile method



This method provides an objective information about microbe phase transition which has depended on engineer's experiences on the spot until now.

# Conclusion

**Water** on high temperature and pressure (120~450°C, 1.5~350atm)

$T_c=374^\circ\text{C}, P_c=220\text{atm}$

Supercritical fluid **carbon dioxide** (30~250°C, 80~350atm )

$T_c=31^\circ\text{C}, P_c=73\text{atm}$

- Organic to Inorganic
- Waste treatment to manufacturing
- Application to basic
- Intellectual properties
- Assessment of technology

Advantage • Disadvantage • Application range

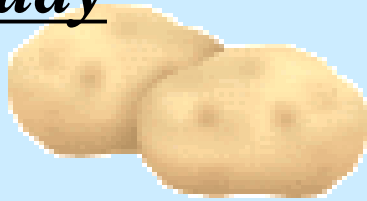
- > Concern about incinerator foundation, problems of final disposal places
- > Strengthening environmental regulation and worry for the future.
- > New industry creation, increase of crude oil price, decrease in CO<sub>2</sub> gas discharge

If you have studied the past studies firmly, you would know that you still have the chance.

Just make sure that you know where you stand.

# Collecting dextrin from potato

## In this study



High-temperature high-pressure water reaction

Non-shipment potato 580,000 tons/year

## Conventional method



Refining



Starch

Thermal hydrolysis

Addition of hydrochloric acid  
Processing time : 9hours

Potato for starches

## Indigestible dextrin

Water soluble dietary fiber

Food for specified health uses

Physiological function

- Intestinal regulation effect
- Blood sugar regulatory effect



- Unit price 400yen/kg
- Market scale 2 billion yen

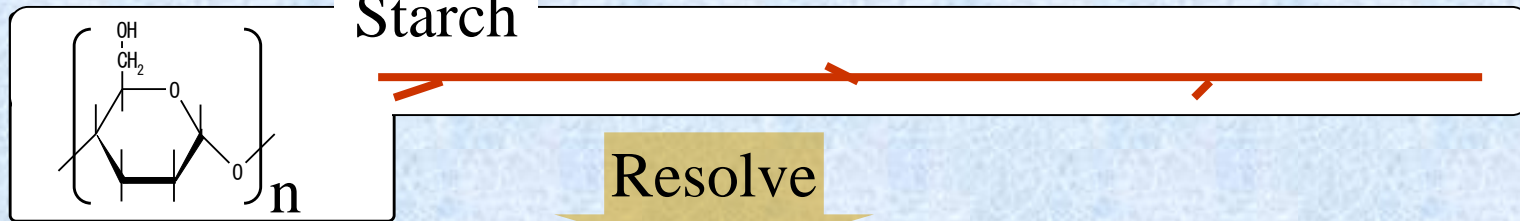
## Objective

The Indigestible dextrin is produced without catalyst under short time by potato.

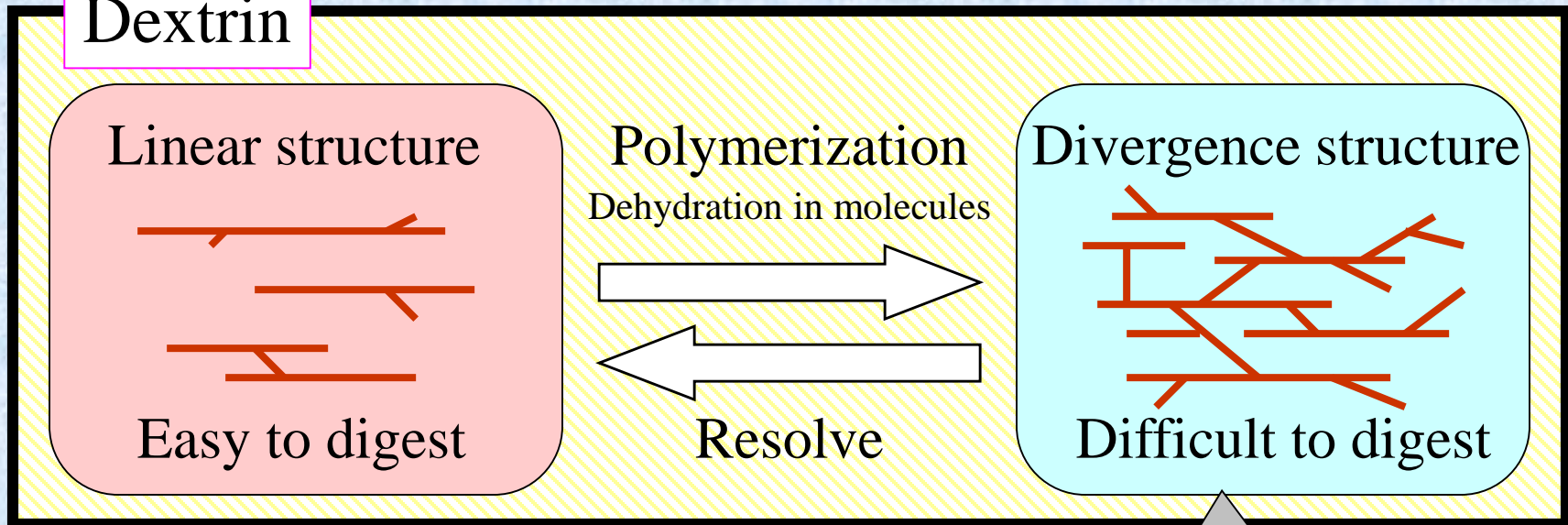
○Production method for dextrin hard to digest, using steam blasting apparatus.

# Indigestible dextrin

n=10000~

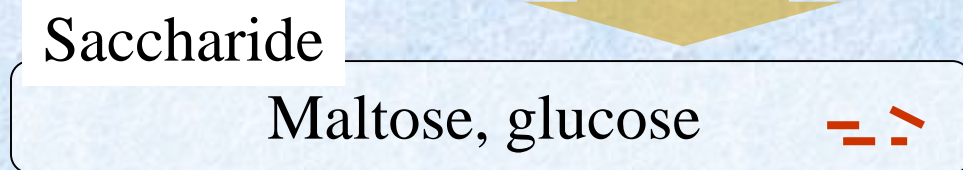


100~



2~

(Polymerization)

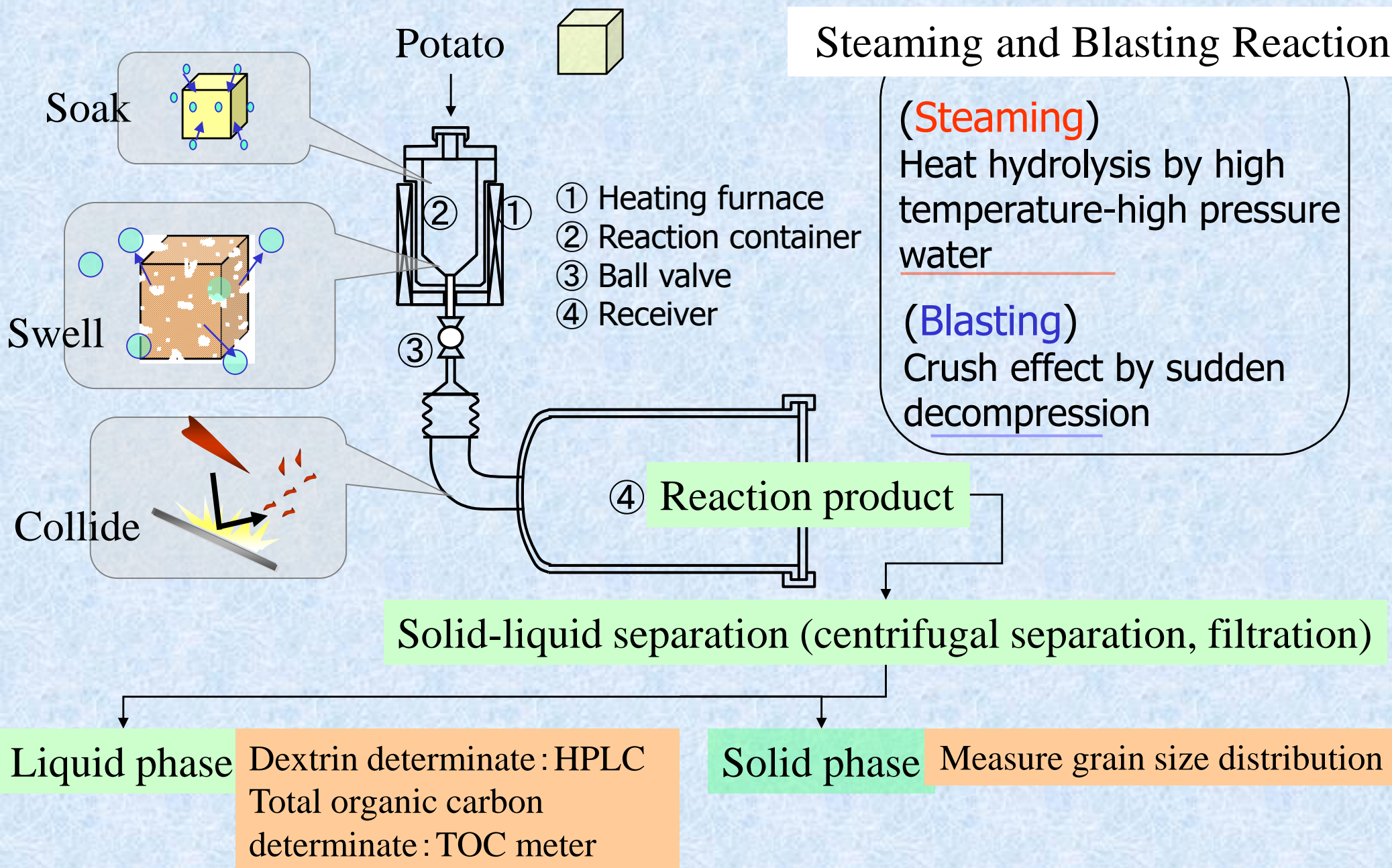


Undigested by an internal enzyme

The marketing products contain rich-indigestible mixture (Indigestive dextrin)



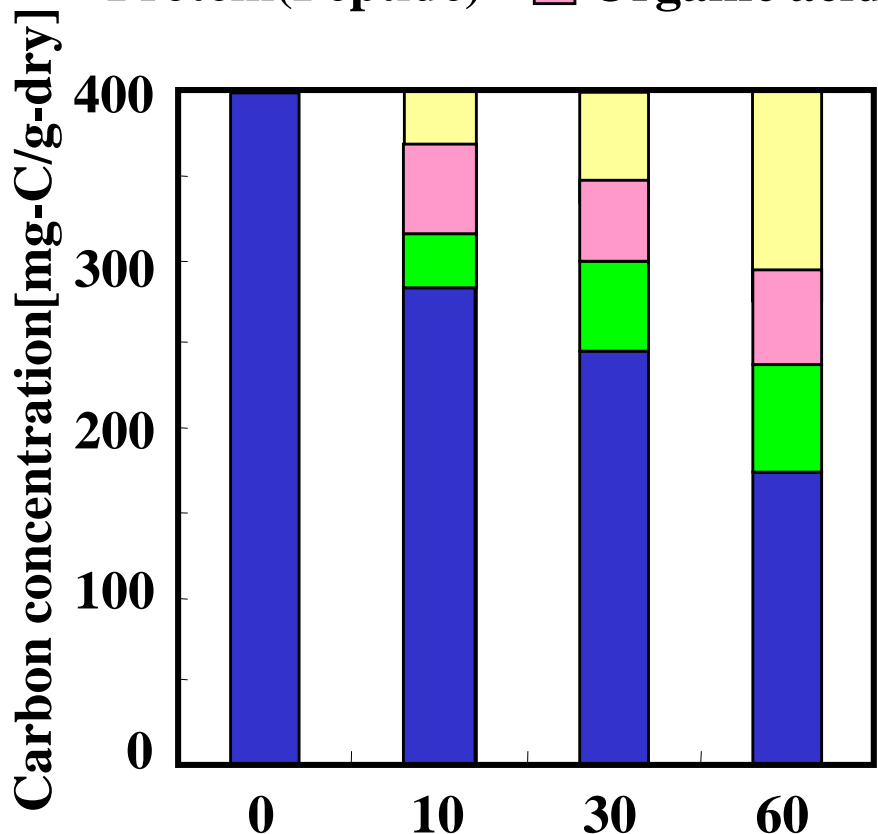
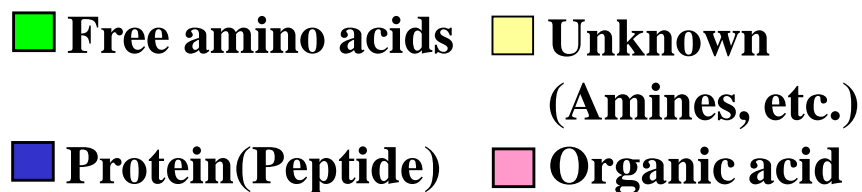
# Reaction Device and Experiment Procedure



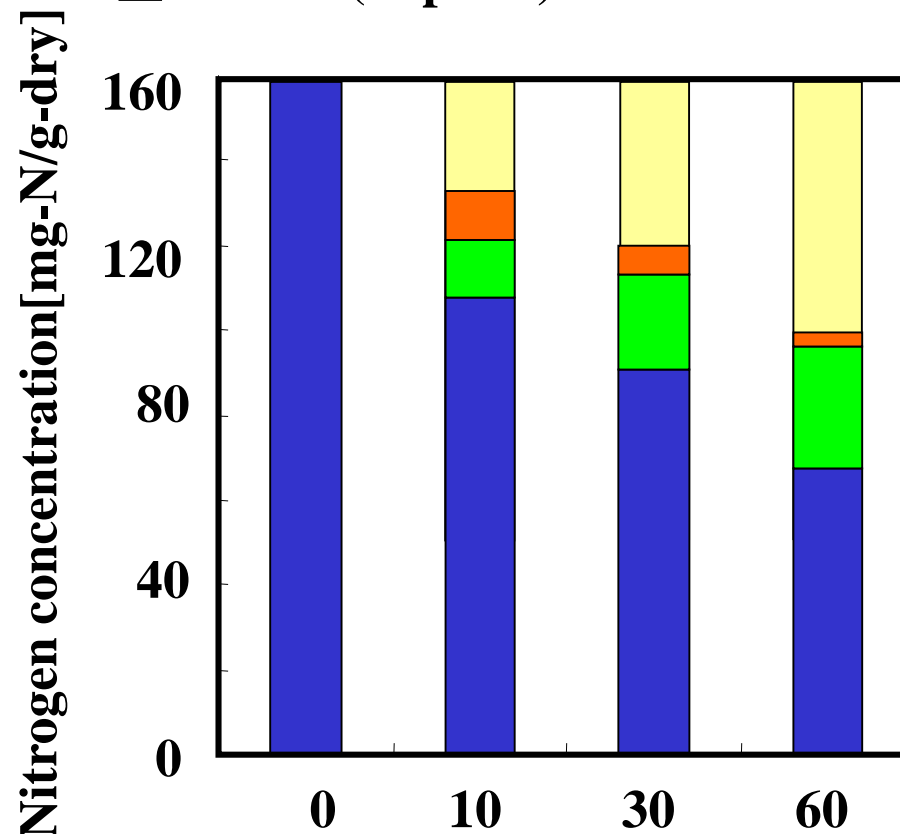
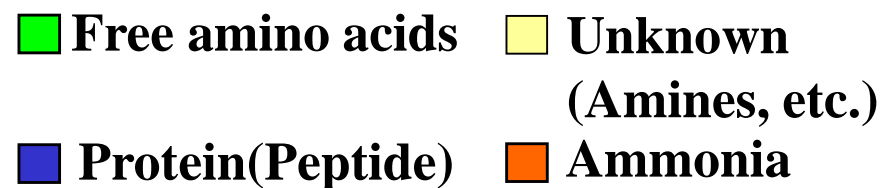
# Carbon and nitrogen balance by reaction of collagen

260°C、4.7MPa

## Carbon balance



## Nitrogen balance



Reaction time [min]

# Noble metals recovery from exhaust gas catalyst of automobile

Increase of automobile catalyst



Used catalyst



Pt : 300-1000 μg/g  
Pd: 200-800 μg/g  
Rh: 50-100 μg/g

**Longtime problem**

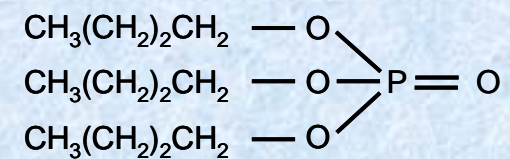
Landfill  
Illegal dumping, etc.

**Low recycling rate (16% in USA)**

**SFC with CO2**  
Separation and recovery of each metal

**SFE with CO2**  
(Addition of oxidizing agent and complexing agent)  
Extraction of metal · residue utilization

Complexing agent  
: Tributyl Phosphate



- No secondary pollution
- Low environmental impact
- Low cost
- No special facilities
- High recovery rate

**Market of 10 billion yen per year**

Toyohashi city is "Specific district of automobile"

Existing technology:  
Electrolysis, Fusion, Dipping, Dissolution-Precipitation  
**Problem:**  
High cost, Liquid waste treatment, Low recovery rate

# Next generation type microbial index analysis

Quinone profile method



- Amount of microorganisms
- Diversity

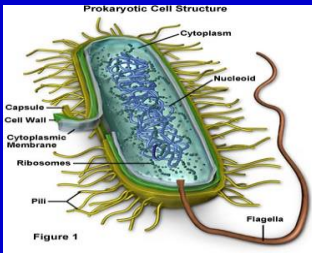


Structure of microbial community

- Control for active sludge method
- Soil improvement
- Compost evaluation
- Methane fermentation control



Microorganisms



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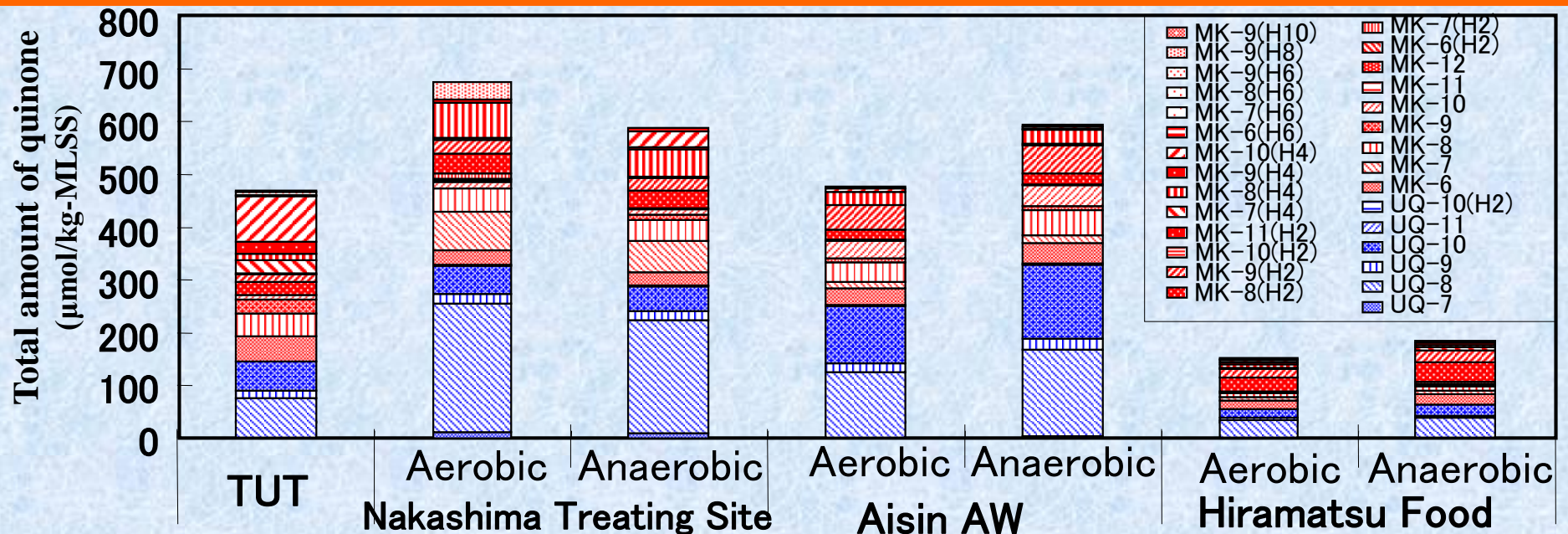
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Expansion of application range



● Foundation of company on analysis

# SFE for Quinone Analysis



MLSS (g/L)	7.17	2.07	1.89	3.05	2.71	10.04	17.87
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