

## Discovery of Multiple Species of Marine Degrading Bacteria For Plastics Containing the Additive P-Life! –Improving the Marine Environment and Working Toward a Solution for the Plastic Problem

A research team consisting of **P-Life Japan Inc.** (President: Isao Toyama, Head Office: Setagaya-ku, Tokyo), Keio University (President: Kohei Itoh, Location: Minato-ku, Tokyo), Ito En, Ltd. (President: Daisuke Honjo, Head Office: Shibuya-ku, Tokyo), SI Resin Industry Co., Ltd. (Currently: Green Value Co., Ltd. President: Tsukasa Yamamoto, Location: Taito-ku, Tokyo), Keio Leading-Edge Laboratory of Scientific and Technology (Director: Hiroyuki Tsuda, Location: Yokohama City, Kanagawa), and Shonan Trading Co., Ltd. (President: Norio Hashimoto, Location: Yokohama City, Kanagawa) has successfully isolated **marine decomposition bacteria** suitable for **polyolefin-based plastics containing the additive P-Life**, which imparts **biodegradability to plastics**.

### RESEARCH FINDINGS

#### **Polyolefin-based plastics containing P-Life are biodegradable even in marine environments**

This achievement is an important discovery demonstrating that polyolefin-based plastics containing P-Life are biodegradable even in marine environments. Furthermore, these decomposition bacteria are expected to be **effective in the decomposition and removal of microplastics** generated from polyolefin-based plastics in the marine environment.

### PRINCIPAL RESEARCHERS

Naohiko Zeze (Department of Biosciences and Informatics, Faculty of Science and Technology, Keio University), Ying Huang (Researcher, Keio Leading-Edge Laboratory of Scientific and Technology), Tomomi Kato (Research Assistant, Miyamoto Laboratory, Faculty of Science and Technology, Keio University), Prof. Kenji Miyamoto (Department of Biosciences and Informatics, Faculty of Science and Technology, Keio University), **Isao Toyama (P-Life Japan Inc.)**, Yoshito Abe (SI Resin Industry Co., Ltd.), Shuji Uchiyama Ito En, Ltd. (Present: Tully's Coffee Japan Co., Ltd.), Norio Hashimoto (Shonan Trading Co., Ltd.)

### PRESENTATION DETAILS

These results will be presented at the **2026 Annual Meeting of the Japan Society for Bioscience, Biotechnology, and Agrochemistry** in Kyoto on *March 10, 2026*.

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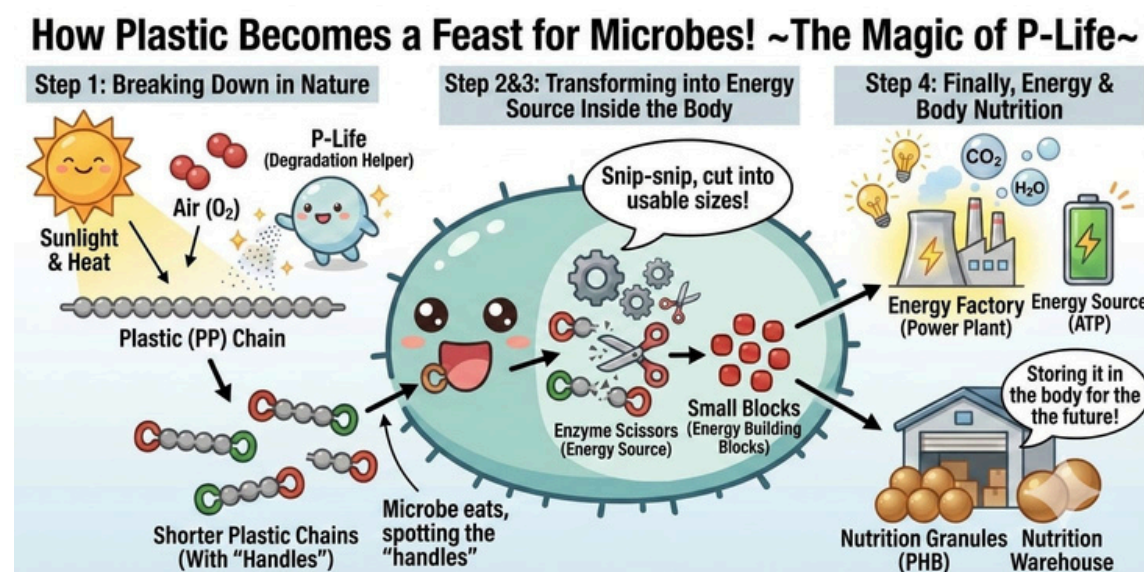
## KEY POINTS OF THIS RESEARCH

- When microorganisms isolated from seawater samples were applied to P-Life-containing PP straws, clear decomposition traces were confirmed.
- It was found that these decomposition bacteria also decompose P-Life-containing PE and PS.

## RESEARCH BACKGROUND

In recent years, the leakage and accumulation of plastic in the environment has become a major social issue. Among these, polyolefin-based plastics are persistent (difficult to decompose), and PP (polypropylene) in particular is extremely difficult to biodegrade in nature. Under these circumstances, **President Toyama** of our company developed "**P-Life**," a revolutionary additive that imparts **biodegradability to polyolefin-based plastics**. P-Life gradually transforms PP into **low-molecular-weight compounds** possessing functional groups, and these low-molecular-weight compounds are slowly **metabolized and decomposed by microorganisms** living in the natural environment.

In our previous research, we discovered and reported multiple decomposition bacteria for **P-Life**-containing PP. However, those decomposition bacteria were derived from soil, and it was unclear whether decomposition would occur in marine environments. Therefore, in this study, we succeeded in isolating **marine decomposition bacteria** for the first time by optimizing the search sources and separation conditions.

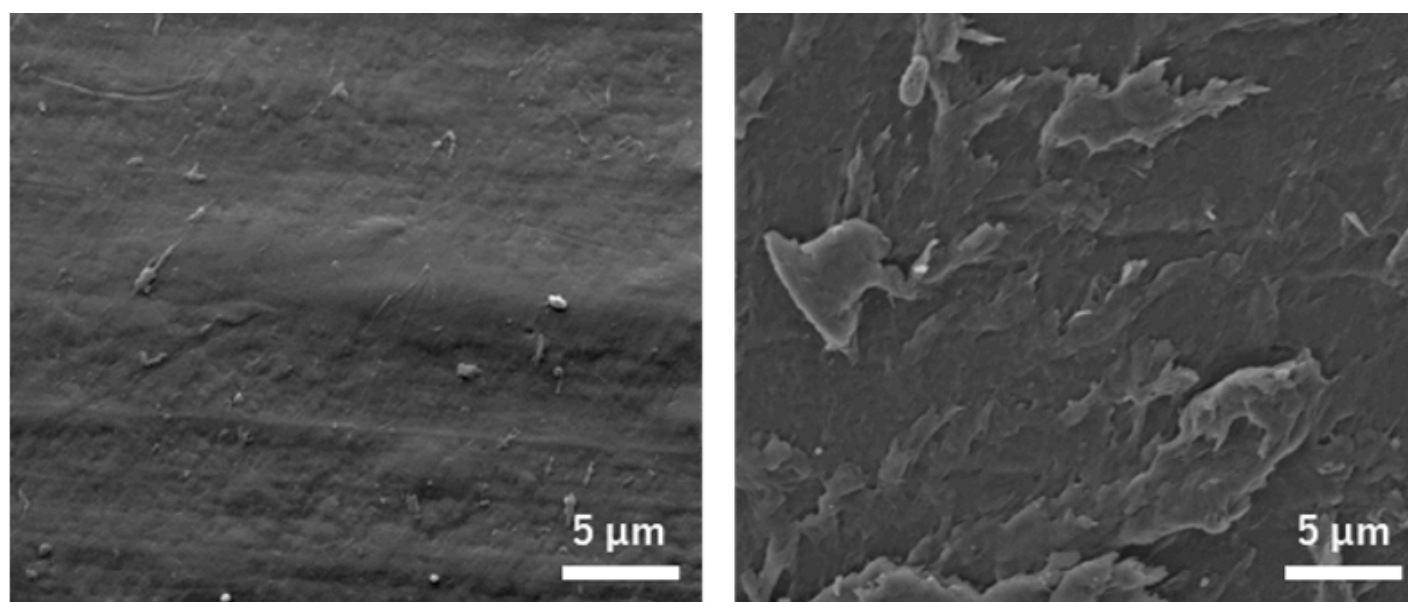


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## RESEARCH CONTENT & RESULTS

The purpose of this study was to search for bacteria capable of biodegrading **P-Life-containing plastics** in the **marine environment** and to evaluate their decomposition capabilities. Using seawater collected from the Izu Peninsula and the Kawasaki coastal area, we performed enrichment cultures using low-molecular-weight components derived from P-Life-containing PP as a carbon source, and isolated 75 strains of bacteria. From these, we narrowed down to 4 particularly promising strains and performed bacterial identification and decomposition capability evaluation. In decomposition experiments targeting P-Life-containing PP straws, **decomposition traces** on the straw surface (Figure 1, right) and **mass reduction** were observed, confirming their decomposition capability. The decomposition bacteria we isolated showed **higher decomposition activity than known oil-degrading bacteria**.



**Figure 1:** Electron microscope images of the surface of P-Life-containing.

PP straws Untreated straw (Left) and Microorganism-treated straw (Right).

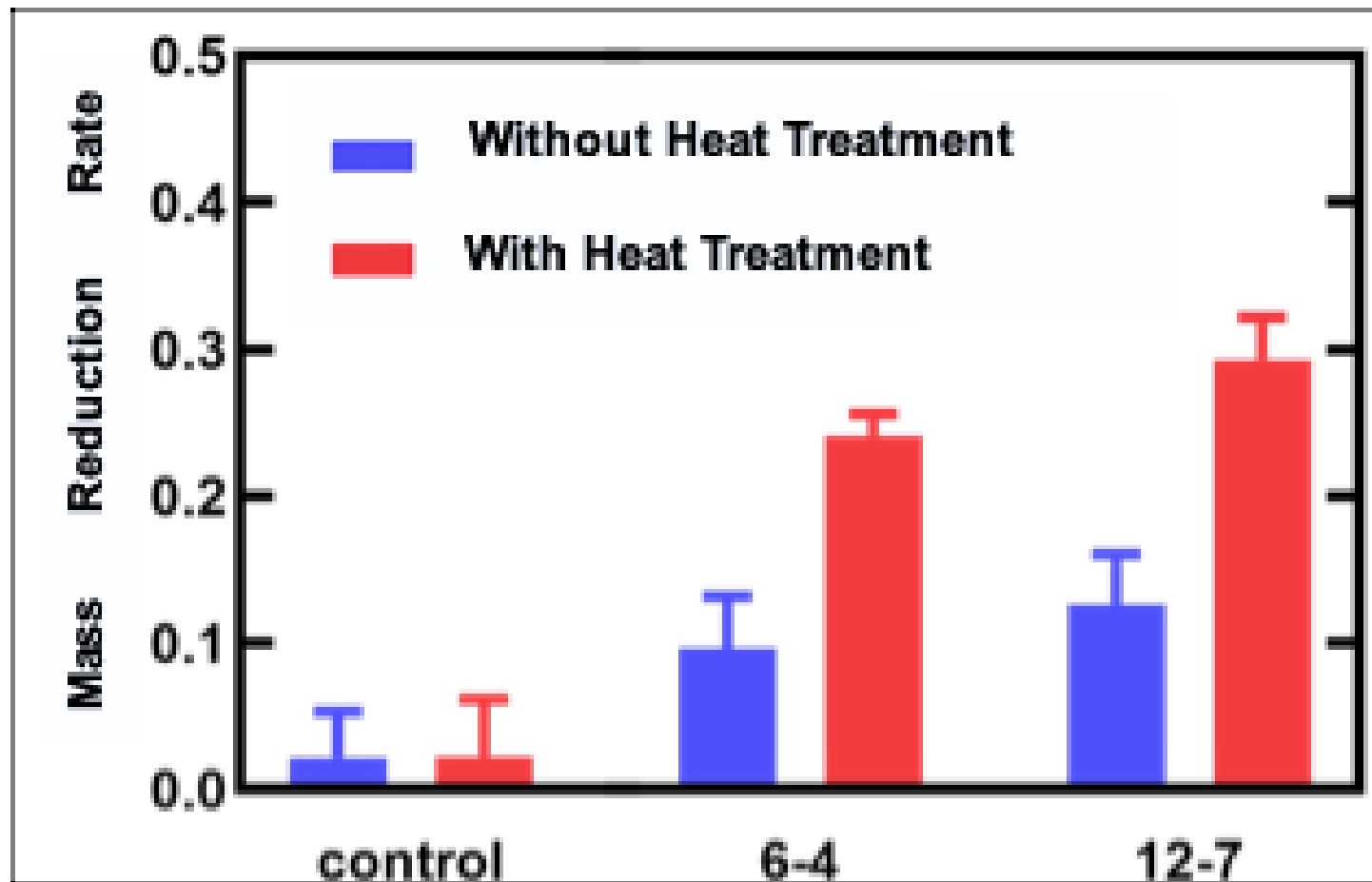
Furthermore, we verified the impact of heat and UV treatment on decomposition speed (Figure 2). We similarly evaluated the decomposition capability for P-Life-containing PP and PE film products, as well as additive-free films, and confirmed that the addition of **P-Life improves decomposition efficiency**.

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**Figure 2:** Mass reduction rate of P-Life-containing PP straws (Graph Legend: Blue = No heat treatment, Red = With heat treatment / X-axis: control, 6-4, 12-7).

## FUTURE PROSPECTS

We have discovered **marine decomposition bacteria** for **P-Life**-containing PP and revealed that they possess high decomposition capabilities. By combining the decomposition bacteria found in this result with P-Life, a **drastic improvement in decomposition efficiency** in the **marine environment** becomes possible. These marine decomposition bacteria are expected to make a significant contribution toward **solving the microplastic problem**.

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## CONFERENCE PRESENTATION INFORMATION

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**Event:**

2026 Annual Meeting of the Japan Society for Bioscience, Biotechnology, and Agrochemistry

**Date / Venue:**

March 10, Doshisha University, Imadegawa / Muromachi Campus

**Title:**

*Isolation and Decomposition Capability Evaluation of Marine Bacteria Decomposing P-Life-containing Plastics*

**Presenters:**

Naohiko Zeze | Ying Huang | Tomomi Kato | Isao Toyama

Yoshito Abe | Shuji Uchiyama | Norio Hashimoto | Kenji Miyamoto

**Research Funding:**

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**Term Explanations:**

**P-Life:** A revolutionary additive that guides *persistent plastics*, which are considered difficult to biodegrade, toward microbial decomposition. Persistent plastics are transformed by P-Life into low-molecular-weight compounds possessing functional groups, making them easier for microorganisms to decompose. Furthermore, P-Life is manufactured from plant oil and is highly safe. Also, P-Life does not affect the physical properties or processability of PP.

**Polyolefin-based plastics:** A general term for high-molecular compounds synthesized using simple olefins as monomers. Representative examples include *Polyethylene (PE)* and *Polypropylene (PP)*. Generally, *biodegradation by microorganisms is difficult*.



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