

# Breeding of useful microorganism by neutron irradiation

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## 1. Introduction

Fermented foods, which are deeply related to the Japanese food culture, provide characteristic flavors and functional ingredients to foods due to the fermentation properties of microorganisms. The breeding of useful microorganisms is expected to create new added value for foods. In these point in mind, exposure of chemicals, UV, X-ray,  $\gamma$ -ray and heavy ion beams have been applied for microorganism breeding, however, little is known regarding the application of neutron yet. Neutron beam induce double strand breakage of DNA molecule as similar to heavy ion beam, like heavy ion beams, therefore expected to produce microorganism with affected fermentation properties with a higher probability than mutations occurring in nature. In this experiment (2022PM4003), the effects of neutron irradiation were investigated on *sake*- and *natto*-fermenting microorganisms, as a continued of 2021PF4007.

## 2. Experiment

The *sake*- and *natto*-fermenting microorganisms were enclosed the screwcap tubes, and these tubes were sealed in aluminum cell (Figure 1) for the neutron irradiation experiments using BL20 (iMateria). These microorganisms were cultivated on agar medium to investigate the effect of neutron irradiation.

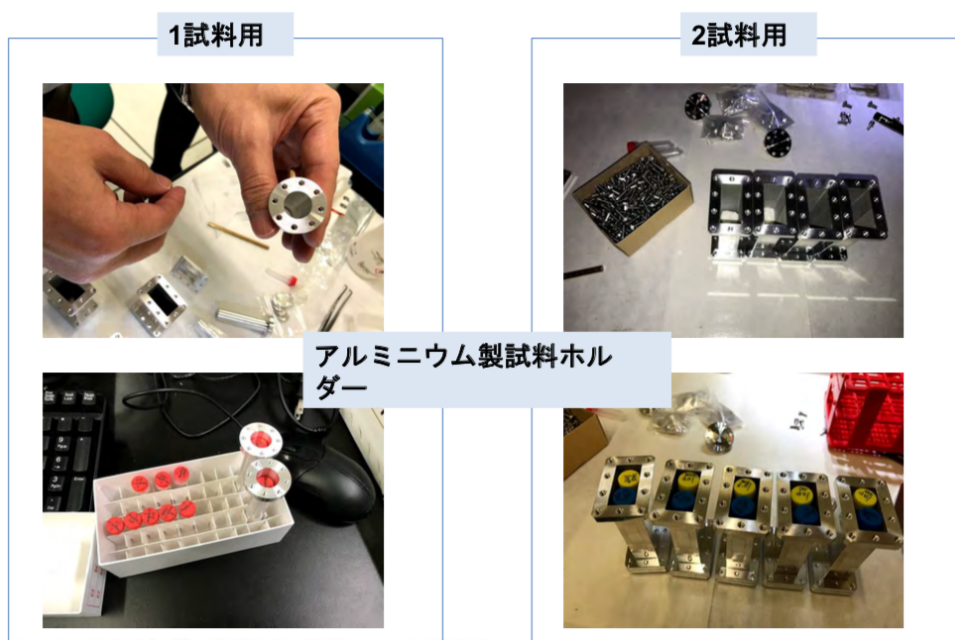


Figure 1. The preparation of samples for neutron irradiation.

## 3. Results

The lethality rate of *sake*- and *natto*-fermenting microorganisms were 30-50 % unless of

irradiation time. The mutated microorganisms were selected by assimilation properties, then the genome sequences of these micrograms were further analyzed by next generation sequencer (NGS). The whole genome sequencing revealed several deletions or insertions.

#### **4. Conclusion**

Neutron beam irradiation efficiently induced the mutation of microorganisms with different assimilation properties. The investigations of mutated gene, details of mutation, and the effects of food fermenting properties are underway.