

Radioisotope Research Facility

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General Summary

The Radioisotope Research Facility was established to support medical and biological research with isotopes. We have supported researchers by suggesting methods and practical techniques for experiments. Lectures and training sessions were held for researchers and for medical students and graduate students who are starting to work with radioisotopes. In 2008, 42 researchers from 12 departments consulted this facility for 33 studies.

Research Activities

Panton-Valentine leukocidine phages

The genotypes and Staphylococcal cassette chromosome *mec* (SCC*mec*) types of community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) strains have been investigated. With the polymerase chain reaction method, we examined Panton-Valentine leukocidine (PVL)—converting types of 67 MRSA strains isolated in Japan in 1979 through 1985 and in the 2000s and found that 2 morphologically different phages predominated in Japan. The icosahedral head type was identified in 39 of 53 strains isolated from 1979 through 1985. Of the other 26 strains, 25 belonged to the elongated head type. Because the same phage-type strains carry various SCC*mec* elements, the methicillin-sensitive strains lysogenized with the PVL phages likely acquired the SCC*mec* elements independently.

The second active site of teicoplanin

The strong synergistic activity of glycopeptide antibiotic teicoplanin with beta-lactams against MRSA suggests an additional mechanism of action. We have speculated that the ATP-binding cassette transporter A is the possible second action point of teicoplanin. Expression of the *abcA* gene was repressed with inducible antisense RNA technique. Downregulation of the ATP-binding cassette transporter A selectively increased the susceptibility to teicoplanin.

Analysis of the resistance mechanism in radiation resistance organisms

Tardigrada (*Macrobiotus*) were isolated from mosses growing on the streets around The Jikei University and were irradiated with X-ray at doses of 300 Gy. DNA samples were extracted from *Macrobiotus* at 5 minutes and 2 hours after irradiation and compared with unirradiated DNA. Agarose gel electrophoresis of the DNAs revealed that *Macrobiotus* can repair within 2 hours the low molecular weight DNA fragments damaged by X-ray.

Cherenkov counting of ^{14}C

We developed Cherenkov counting of ^{14}C with a microplate liquid scintillation counter using a translucent ceramic (Lumicera, Murata Manufacturing Co., Ltd.). The detection efficiency under optimal conditions was 5.0% for the new type-Z ceramic.

Research on marine bacteria

The habitat distribution of several marine bacteria was surveyed during *Tansei Maru* cruise KT-08-13. To study the metallic transport system of microbes, we focused on marine bacteria that produce siderophores in a low-iron environment. We are attempting to cultivate such bacteria from seawater and the sediment of the sea floor at a depth of 4,000 m.

Publications

Ma XX¹, Ito T¹, Kondo Y¹, Cho M¹, Yoshizawa Y, Kaneko J², Katai A³, Higashiide M¹, Li S², Hiramatsu K¹ (¹Juntendo Univ, ²Tohoku Univ, ³Kinan Gen Hosp, ⁴Kotobiken Med Lab Inc). Two

different Pantone-Valentine leukocidine phage lineages predominate in Japan. *J Clin Microbiol* 2008; **46**: 3246-58.