Prof. Mitsunori Kirihata: concentrating on boron chemistry, promoting the development of boron neutron capture therapy

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Editor's note

The 3rd Annual Academic Conference of Taiwan Society of Neutron Capture Therapy [Jointly with the 10th Trilateral boron neutron capture therapy (BNCT) meeting between Taiwan and Japan] was successfully held on 27 January, 2018 at Taipei Medical University. An army of the world-renowned experts were invited to this high-quality academic exchange platform where they shared the topics including the new era of BNCT, AB-BNCT projects, low-dose gamma irradiation, malignant brain tumours, and so on. At this conference, we had the great honor to invite Prof. Mitsunori Kirihata (*Figure 1*), Research Centre of Boron Neutron Capture Therapy, Osaka Prefecture University, to have an exclusive interview with us (*Figure 2*).

Figure 1 Photo of Prof. Mitsunori Kirihata.

Figure 2 TRO editor took a photo with Dr. Mitsunori Kirihata after the interview.

Expert introduction

Mitsunori Kirihata currently serves as the professor of the Research Centre of Boron Neutron Capture Therapy, Osaka Prefecture University, Japan. His research focuses are on cerebral neurosurgery, bioorganic chemistry, clinical oncology and so on. He has published a lot of papers and plenty of books related to boron chemistry and BNCT with more than 2,000 citations, for instance, *Advances in Neutron Capture Therapy*, *Cancer Neutron Capture Therapy* and *Study of the interaction of p-boronophenylalanine and its analogues with various carboxylic acids by using a zone electrophoresis*.

Know more about BNCT

BNCT is a non-invasive therapeutic modality using the non-radioactive isotope boron-10 (^{10}B) for treating locally invasive malignant tumors, for instance, primary brain tumors and recurrent head and neck cancer. BNCT can be mainly divided into two parts. Firstly, the patient is injected with a tumor-localizing drug containing the non-radioactive ^{10}B having a high propensity or cross section (σ) to capture slow neutrons. The cross

section of the ^{10}B is much greater than that of the other elements present in tissues, like hydrogen, oxygen, and nitrogen.

In the second step, the patient is radiated with epithermal neutrons, the source of which is either a nuclear reactor or an accelerator. After losing energy as they penetrate tissues, the neutrons are absorbed by the capture agent, which subsequently emits high-energy charged particles that can selectively kill tumor cells that have taken up sufficient quantities of ^{10}B.

The linkage between boron chemistry and BNCT

"When I was young, I started to synthesize various kinds of Boron compounds.", Prof. Mitsunori Kirihata recalled the moment when he set foot on the path of BNCT, "I am an organic chemist. In the 1970s, I concentrated on the research of Boron compound which is highly vital to BNCT. I think it was really a milestone to me."

Working hard on BNCT, striving for excellence

Speaking of the unforgettable moments or frustrations in BNCT research for years, Professor Kirihata clarified that he is not a medical doctor but a chemist. He mainly put the emphasis on the core research of BNCT. He thinks BNCT is a highly-effective therapy for cancer, which can help a lot of people. Therefore, the exact therapy conditions or the patient's situation should be completely studied in this research laboratory to have a better understanding of BNCT. "Rome is not built in a day, it is impossible for BNCT to develop rapidly without the foundation research," he said.

Highlights of the research studies

Prof. Kirihata is now 71 years old. He retired from the university and established his own institute in the campus about 5 years ago. Though being a retired professor, he still focuses on BNCT research in the research institute and hopes he and his research team can promote and boost the development of BNCT.

On the day, Prof. Kirihata's speech topic is "*Development study on novel synthetic method for [^{18}F]-L-$^{18}FBPA$ using ^{18}F ion*", When asked about the trend of Boron Chemistry, Prof. Kirihata pointed out that, "Boron Chemistry is not easy. The Carbon and Boron chemistry can integrate and produce a new area which is called boron medicinal chemistry. My dream is to establish a new chemical field so that BNCT can be further developed based on the discovery of this field. I hope the youth who are interested in the new medical Boron Chemistry can strive for the best and produce a new compound someday."

Messages to the youth

As a mentor, Prof. Kirihata has the following message to the young doctors who would like to devote to BNCT.

"*If the future pillars of our society are interested in the Boron Chemistry, please come to Japan. I will try my best to broaden your horizons in my institute. There are many international cooperation studies, exchange programs, lectures and so on in the research center which has established true friendships with many world-famous universities.*"

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