Special Article

An Odyssey in the Domain of Nuclear Medicine

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> *" In the history of Sciences, nothing is more true than that the discoverer, even the greatest discoverer, is but the descendant of his scientific forefather; he is always essentially the product of the age in which he is born."*
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> *Sylvanus P. Thomson,*
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> *THE ROENTGEN SOCIETY, LONDON*
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Works in Radiology in Thailand started, as in anywhere, with Diagnostic X-Rays and Radiotherapy. As for Siriraj Hospital, the first x-rays machine, which ranked the eighth in Thailand, was installed in 1928, whereas deep X-rays machine and ^{226}Ra came into use at Siriraj in 1935 and 1938, respectively.

My radiological career began in the Department of Radiology as a senior house officer. In 1951 an acquisition of a ^{60}Cobalt teletherapy unit, and a post-graduate study tour were planned through an assistance of the US government. I travelled back and forth between California and Washington DC negotiating for a donation of the teletherapy unit. The Picker 1500 Ci teletherapy unit and its technology were studied under Fletcher's supervision in Houston. The US donated unit was then installed and first used in Siriraj Hospital in 1959.

During my stay in the US, I was much intrigued in the dynamic ^{131}I studies in various conditions by Solomon Berson and Rosalyn Yalow in Bronx, New York. I made a visit to them to seek an advice on the thesis for M.Sc in Medicine of the University of Pennsylvania. These two scientists were later nominated by me of the then University of Medical Science in Bangkok to the Nobel Foundation for their work on radioimmunoassay: they became the Nobel Prize winners in science. In America, I enjoyed acquiring a lot of experiences in basic research in Nuclear Medicine by working with John H. Lawrence at Berkley; Taplin at UCLA; Hodges, Simon and Beiwaltes at University of Michigan; Axelrod and Bale at Royal Victoria Hospital in Montreal; Rall and Robbins at National Institute of Health in Washington DC; Stanbury and De Groot at Massachusetts General Hospital in Boston; Wagner and McIntyre at John Hopkins; Dave Kuhl at the Hospital of the

University of Pennsylvania; and with Hal Anger at Berkeley Lawrence Laboratory. On several evenings in 1951, I participated Dave in making his home furniture down in the basement laboratory. Dave was working on fluoroscopic TV and tomographic devices. Hal Anger, on the west coast, was experimenting on organ imaging and taking pictures of ^{131}I thyroid from an old oscilloscope with a polaroid camera. I was so thrilled by both inventors that I predicted in 1958 that Dave's and Hal's inventions would hand in hand lead to a kind of specialized electronic camera, a revolution in Nuclear Medicine. Interstate travels were by Transpacific Railroad and Feather River route starting from Los Angeles through the country to Chicago, Michigan and then to Montreal and Ottawa. The study tours were unique and proved to be effective as the schedule and the scientists were specifically set and selected by me out of my own free will covering aspects of my interest - cancer, immunology and thyroid diseases.

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Nuclear Medicine was first established in Thailand at Siriraj in 1955 as a new speciality attached to the Department of Radiology under Professor Luang Binbakya Pittayapet's supervision. In the beginning it was named "Radioisotope Lab", and situated on the second floor of the old Radiology Building at the back of the memorial statue of Prince Mahidol. At that time the Radioisotope Lab occupied plenty of space on the second floor. I had to carry water upstairs for essential consumption. The Lab was originally run by one man, me, and a nurse, Phenkae Raktabutra . We both took charge of almost everything serving diagnostic, therapeutic and investigative services. A self-designed small hot laboratory at the back of the building and a small radioisotope store room under the ladder pathway were economically constructed with sufficient amount of lead shielding. Up on the second floor was the second-class (modest) furnishing lab to serve the patients and do some in-vivo and in-vitro diagnostic studies.

During the demolition of the old Radiology Building to site the 72 Anniversary Building, the Radioisotope Lab was moved to the Central Administration Building occupying one big room for teaching and office, a measurement and scanning room, and a small radiochemistry room. A separate small space between buildings was arranged to function as a temporary hot lab. I participated Norman Veall in making Pasteur pipettes and column for separation of labelled cations using Amberlite IRA 400 resin (Cl^- form). Some glass wool was put into the column to support the resin during filtration. Technique of labelling bromsulphthalein (BSP) with ^{131}I to be used as a liver agent was investigated and modified. I had a chance to work closely in Thailand with Keith Britton performing vascular, parenchymal and biliary compartmental analysis using

^{131}I-BSP. Iodine metabolism, food iron absorption and double fortification were also assessed in northern villagers. Russell Fraser also did some work with me in Thailand.

The first rectilinear scanner (3" Picker Magna Scanner) was installed in the Lab in 1963. In the same year, the Office of Atomic Energy for Peace (OAEP) was able to give supplies of ^{24}Na, ^{40}K, ^{82}Br, ^{32}P and ^{198}Au. ^{131}I and other essential radioisotopes were shipped from the Radiochemical Centre at Amersham in UK. ^{131}I played the most important role in Nuclear Medicine as a tracer, treatment, and scanning radionuclide then. Not until 1966 that the supply of ^{131}I was feasible from the OAEP. In this year too Siriraj Hospital installed the first planar gamma camera (Nuclear Chicago Pho/Gamma I).

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In 1971 the Radioisotope Lab was moved to the 72 Anniversary Building occupying half of the third floor. With the advent of ^{99m}Tc as a better scanning radionuclide, the name of the Radioisotope Lab was changed into the Division of Nuclear Medicine. ^{99m}Tc generators were all originally imported until the OAEP was able to supply instant ^{99m}Tc solution in 1987.

Upon reading Skanse's book, Lawrence's chapters and Stanbury's blue book, I was bathed with the story of endemic goitre, and have been influenced by those scientists' works since then. In the early days, a research team and I made several trips to Phrae province in the north taking with us some essential equipment and an Onan electric generator to evaluate the endemic goitre condition. Kongsakdi Tatiyanukul, an engineer from Vidhyakom company, joined us in some trips. Content of iodine in soil, water and vegetables; 24-hour thyroid uptake of ^{131}I; PB^{131}I conversion ratio and protein bound iodine were investigated. Urine was collected and counted over a Nancy Wood well scintillation counter with no amplifier to confirm daily lower iodine intake. The research result was in accordance with expectation confirming the condition of endemic goitre in the northern region. All data and findings were sent to John Stanbury to be published in the new edition of a text book on thyroid by Means and Stanbury. Through my nomination, Dr. Stanbury won Mahidol Award for his work on iodine deficiency disorders in 1993.

During my term as the Deputy Dean of the Faculty of Medicine (1973-1982) and the Head of The Department of Radiology (1974-1982) at Siriraj Hospital, my interest on environmental human health continued. In an attempt to control the iodine deficiency disorders and an anaemic condition in Thai villagers in the north and northeast of Thailand, an iodine and iron (I&I) project was conducted using the space in the basement of the 72 Anniversary Building. Iodinated salt was originally produced by a locally designed mixing

machine. To improve quality of water for the villagers, basic technique of water filtration and construction of jumbo 200-litre jars were transfered to hundreds of officers of the Division of Accelerated Rural Development of the Ministry of Interior. Iodized water was first introduced and proved to enhance the iodized salt for goitre elimination. Iodized oil in multiple low doses were given to women of reproductive age in the north to prevent them from giving birth to cretins. Food iron absorption, iron enhancers and inhibitors, and double fortification using iodate and FeNa-EDTA were studied and implemented in a number of provinces.

Since my retirement from the Faculty of Medicine in 1985, I have constantly worked on the I&I project stationing at the Nuclear Medicine Research Building right outside the hospital compound. It is really a pleasure for me to experiment on means for a source of iodine by a simple bottle of concentrated iodate source, instantaneous monitoring by semiquantitative detection of iodine by twin bottles, and simple procedure for mixing salt leading to universal salt iodization. Training of promoters of the I&I project was undertaken to gain public acceptance and self-help/self-sufficiency for the control of endemic goitre and neurological cretins. In 1995 it appeared that the prevalence of goitre in the north and northeast of Thailand was about 10 percent. The potential increase of the prevalence occurs if and whenever preventive measures are less stringent. This is the reason why my work has not ended. Nevertheless it is anticipated that the Thai villagers will be free from the IDD condition in the near future.

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Looking back at the scientific way I have gone through I am quite happy to see the continuation in man-power development and availability of high-technology equipment in the nuclear medicine community. In 1985, the first single-detector SPECT was installed at Vajira Hospital. The Nuclear Medicine Society of Thailand was born in 1987. By 1997, there have been 10 two-detector SPECT systems in Thailand.

We, like the ones immediately behind us, have been laying bricks in an orderly fashion for future development of nuclear medicine in Thailand.

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