The Present Status of Nuclear Medicine in Korea*

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It is my privilege to give you a brief history on the status of nuclear medicine in Korea. There is nothing much to mention, as the history of peaceful use of atomic energy is rather short and the RI facilities are limited in the number. It is my sincere hope, however, that you may understand what steps nuclear medicine in the developing countries did take and how it has been developed, seeing the present status of nuclear-medicine in Korea, as one of the models (Fig. 1).

In our country, the peaceful use of atomic energy was actualized since the Law of Atomic Energy had been enacted in March 1959, and the Office of Atomic Energy and the Atomic Energy Research Institute had been established. After the setup of the reactor Triga Mark II with thermal output of 100 KW in the Atomic Energy Research Institute in March 1962, some short-lived RI like Na-24, K-42, Br-82, etc. had ben put into the practical use in the field of the basic medical experiments.

In April 1960, the Radioisotope Clinic and Laboratory was founded in the Seoul National University Hospital as the first RI facility which used the RI for purposes of diagnosis and treatment of the diseases.

In 1961, United States Atomic Energy Commission donated nuclear medical instruments like scanner and detectors, which were alloted to 4

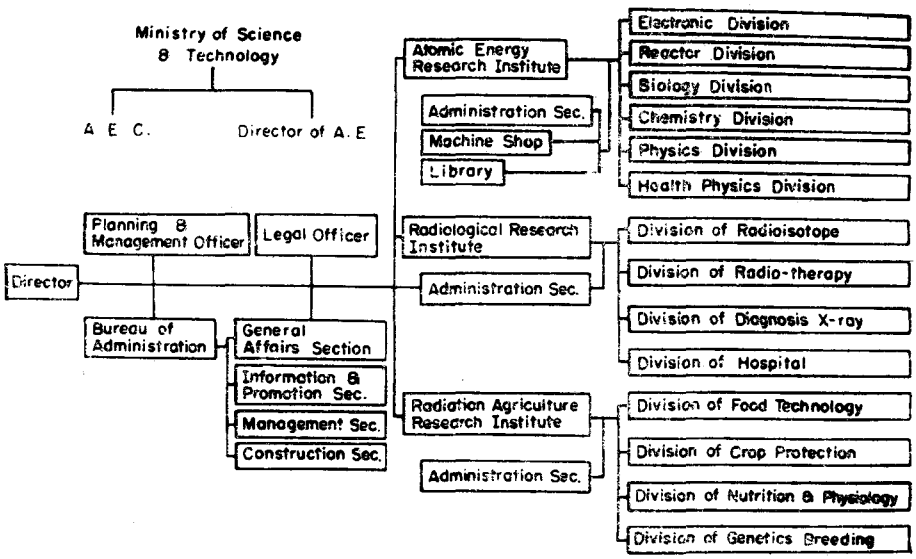

Fig. 1. Organization of office of atomic energy.

* This is the outline of a special speech given before the 8th Japan Conference on Radioisotope(Nov. 13-16, 1967 Tokyo, Japan)

Table 1. The main R.I. equipments in medical field

Kind	No.
Medical scintillation counter	10
Scintillation detector	11
Well type scintillation detector	9
Scanner	9
Renogram	4
Liquid scintillation detector	2

Table 2. Radium therapy facilities

	Hospitals	Amount(mg)
1	Seoul Transportation	33
2	Chunju Provincial	17.8
3	Taegu Presbytarian	100
4	Yu's Ob. 8 Gy. Clinic	80
5	Severance	230
6	Seoul University	478
7	Soo-Do Medical School	115
8	Korea Electric Co.	190
9	Ewha Woman's Univ.	100
10	Radiation Res. Inst.	190
	Total	1,533.8

Table 3. X-ray appliances and other therapy facilities

Hospitals	Equipment	
Seoul Transportation	Tokyo Denki	200KVP 3mA
Taegu Presbytarian	Maximar, 250-Ⅱ Keleket	250KVP 15mA 400KVP 10mA
Chunju Presbytarian	Maximar, 250-Ⅱ	250KVP 15mA
Kyong-Pook Univ.	Zephyr Picker	120KVP 15mA 260KVP 18mA
Catholic Med. Sch.	Maximar, 250-Ⅲ	250KVP 15mA
Seoul Univ.	Maximar, 250-Ⅲ Maxitron, 300	250KVP 15mA 300KVP 20mA
Soo-Do Med. Sch.	Maximar, 250-Ⅲ	250KVP 15mA
Severance	Maximar, 250-Ⅲ	250KVP 15mA
Korea Elect. Co.	Cs-137 (2000C, 1962. 2. 14)	
Radiation Res. Inst.	Co-60 (2962C, 1963. 2. 28)	

National University Hospitals. At present, 11 hospitals and medical institutes have RI facilities (Fig. 2, Tab. 1). namely, 6 university hospitals, 1 army hospital, 1 medical research institute and 3 public hospitals. Other than these, there

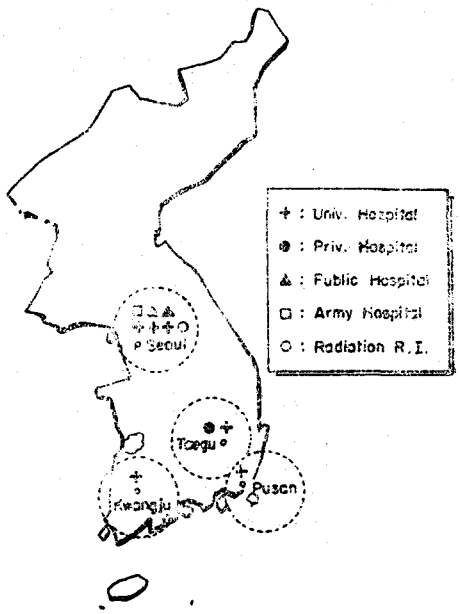

Fig. 2. Facilities where R.I. is used.

Table 4. Status of R.I. importation and product

Year	Import(mC)	Product (mC)	Total(mC)
1960	1,296.855	—	—
1961	2,563.935	—	—
1962	4,795.12	660.952	5,457.072
1963	18,711.2516	317.2335	19,028.4851
1964	16,218.145	2,178.315	18,396.46
1965	14,100.845	516.7996	14,617.6446
1966	17,121.473	299.6125	17,421.0885
1967 (Jan.-Sept.)	26,697.50	297.146	26,994.646
Grand total	101,405.1246	4,270.0586	105,776.1832

are radium therapy units in total amount of 1,533 mg in 10 national and private hospitals, X-ray appliances and the deep radiation therapy units in 8 hospitals(Tab. 2, 3).

In February 1962, 2,000 Ci Cs-137 source with the instruments was imported and instituted in the Korea Electric Company Hospital, and then 3,000 Ci Co-60 therapy unit furnished in the Radiation Research Institute began its function in 1963.

As is mentioned, the RI facilities and equipments in Korea are very limited in number.

The amount of RI used since 1960 is shown in Fig. 3 & Table 4, when we began to use the

RI in the medical field. As is shown, 41 nuclides in total amount of over one hundred thousand(105, 776, 1832) mCi were used, and is still increasing, however, the increasing tendency in the recent time is not so rapid as was before.

The amount of RI used in each specialty field is shown in the Fig. 4. As is shown, in earlier times, the RI was mostly used in the medical field, for instance, in 1960, about 98% was for medical use, which, however, dropped to about 76% 1965 due naturally to a relative increase in the other fields (Fig. 5).

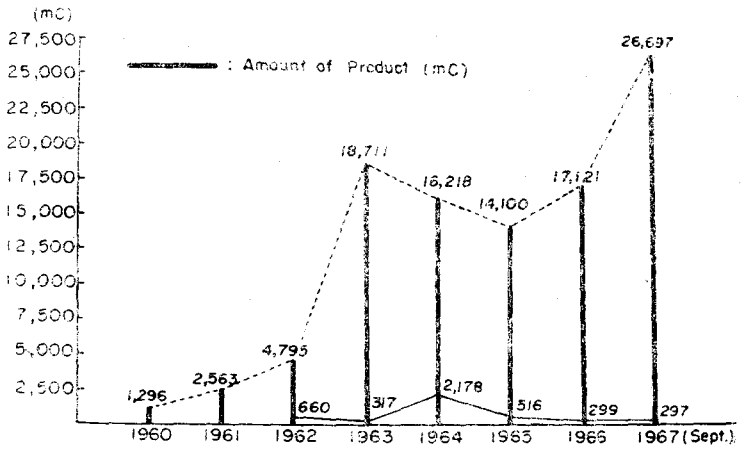

Fig. 3. Total amounts of R.I. imported from 1960 to 1967 (Sept.).

Of total amount used from 1960 to September 1967, 68.8% was for medical, 31.6% for engineering and 0.56% for agricultural uses (Fig. 6). As for the nuclides mostly used, I-131 was in the largest quantity, which totaled to 57.3% followed by Au-198, which totaled to 33.2%. As you may have noticed, there is an apparent difference in the nuclides used comparing with those in the foreign countries. It may be due firstly to the limitations as such of purchasing the expensive nuclides, secondly to the inability of producing short-lived RIs, and thirdly to the differences in the diseases under study, for instance, the Schilling test is not usually applied as pernicious anemia is one of the most rare disease in Korea (Fig. 7).

Since 1962, some short-lived RIs like Na-24, Au-198 were produced, but not in the sufficient quantities as the capacity of the reactor is limited. Recently we have begun to produce I-131 labelled compounds such as Hippuran, RISA and Rose Bengal (Tab. 5). Most nuclides, however, are still imported from abroad, England, France, USA, Netherland and Japan etc. (Fig. 8, 9).

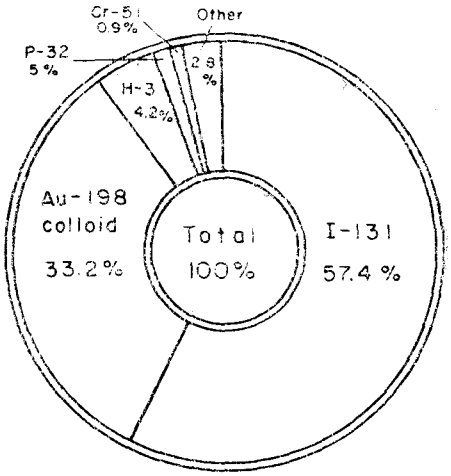

Fig. 4. Total amount of R.I. used in the medical field (1962~1966).

Now I wish to mention about in what medical specialtes the RIs are mostly used. As is shown in the Table 6 & 7, the number of medical publications which used RIs is increasing year by year, of which 49.3% was in internal medicine followed by dentistry and gynecology. The proceedings of the scientific congress of the atomic energy held by the Office of Atomic Energy are classifed on the next slide (Tab. 8).

What I like to mention next is about the Act of Atomic Energy and the function of the Office of Atomic Energy. This act provides that those

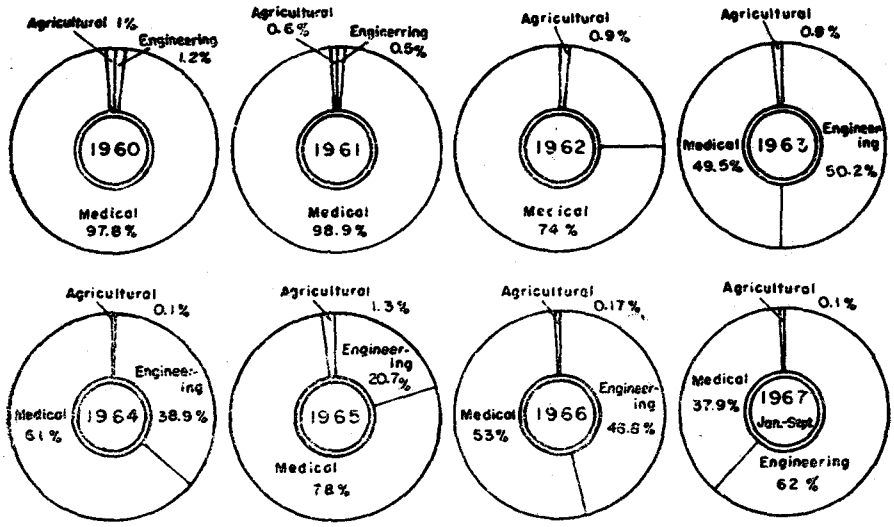

Fig. 5. Yearly use of R.I. in various specialty fields.

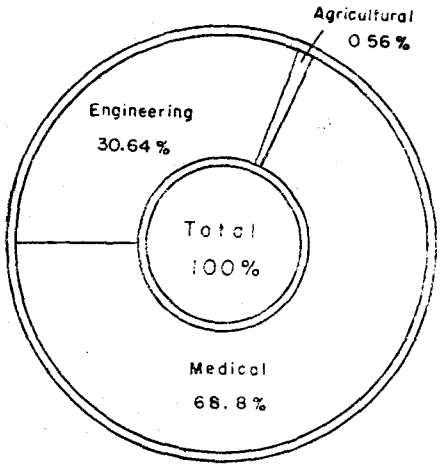

Fig. 6. R.I. using specialty fields (1960~1967 Sept.).

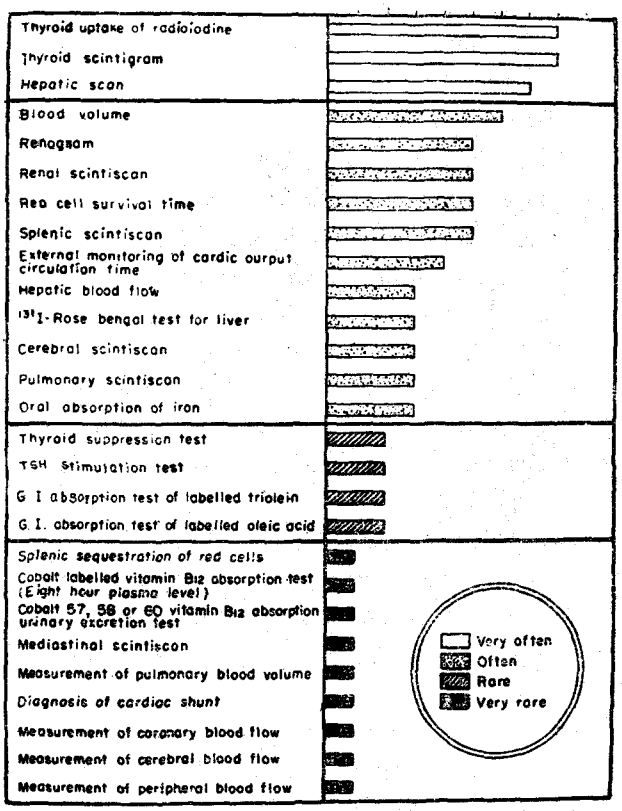

Fig. 7. Diagnostic use of R.I. in Korea.

who wish to handle the RIs for peaceful use should be licensed after a certain training and examination. Each RI laboratory should also have at least one radiation safety officer who is responsible for controlling the waste disposal and for safeguarding the radiation hazards. The Office of Atomic Energy has established a six week training course for the medical application of RIonce a year. The curriculum of the course is shown in the Table 9.

The total number of the licensed physicians are 157, of whom 28 (10.1%) studies abroad assisted by the IAEA and government funds (Tab. 10).

The technical assistance given by the IAEA

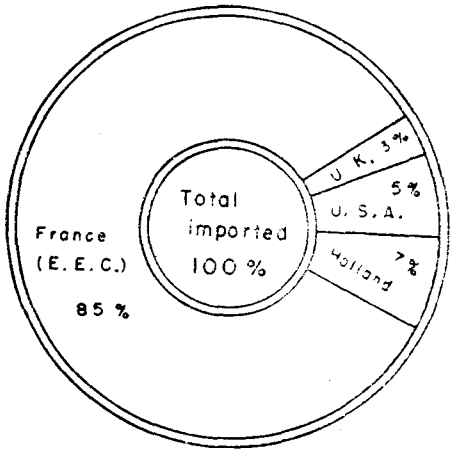

Fig. 8. R.I. supplying countries (1966).

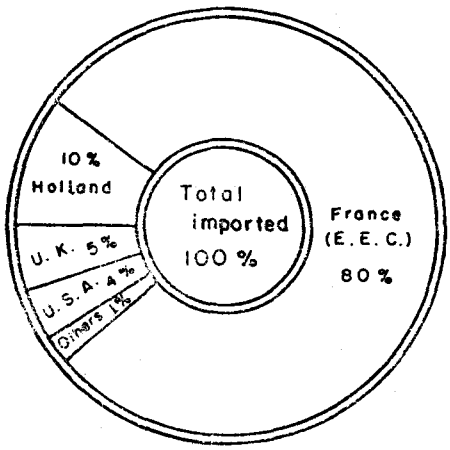

Fig. 9. R.I supplying countries (1967 Jan.~Sept.).

Table. 5. Preparation of radiopharmaceuticals (1966)

Compounds	Preparation activity (mC)	Distributed activity (mC)
Hippuran-I^{131}	40.6	32.3
Hippuran-I^{125}	7.35	5.35
L-Thyroxine-I^{131}	2.5	0.2
L-Thyroxine-I^{125}	0.5	—
Rose bengal-I^{131}	1.5	—
Rose bengal-I^{125}	0.5	0.3
Human serum albumine-I^{131}	3.85	3.3
Human serum albumine-I^{125}	0.5	—
MAA-I^{131}	7.4	3.7
Oleic acid-I^{131}	0.5	—
Triolein-I^{131}	1.5	1.0
NaI^{131} (Sterilized or)	1.5	1.0
Egg albumine-I^{131}	0.6	—
Egg albumine-I^{125}	0.3	—
Hg^{203}-Neohydrine	0.4	0.2
Liver protein & phosphorous	0.8	5.8
Triiodo-thyronine-I^{131}	1.5	—
Triodo-thyronine-I^{125}	0.5	—
Total	77.60	53.70

Table 6. Number of medical publications

Year	No. of medical societies	Total No. of works	No. of works done with R.I.	%
1964	17	621	44	7.1
1965	23	1,072	66	6.1
1966	24	1,610	104	6.3

Table 7. Medical specialties and their works done with R.I. (1966)

Internal medicine	49.0%
Basic medicine	19.6%
Dentistry	13.7%
Radiology	7.8%
Others: Ob. & Gy., Surgery etc.	9.9%

Table 8. Research works appeared in the scientific congress of atomic energy (1965)

Specialties	No. of works	%
Physics & chemistry	16(20)	24.3(21.5)
Engineering	15(13)	22.7(14.0)
Biology and agriculture	15(31)	22.7(33.3)
Medicine	20(29)	30.3(31.2)

No. in parenthesis represents those of 1966

since 1962 is shown in Tab. 11.

The Korean Society of Nuclear Medicine was organized in 1961, which I think is one of the older in the Far East area. The society now holds about 170 members and the annual meetings in addition to the quarterly meetings have been held. The 6th general scientific meeting for 1967 is scheduled to be held in 25 November. The society publishes the Korean Journal of Nuclear Medicine twice a year, and the second issue appeared Oct. 1967.

Table 9. The plan of training course on R.I. application in medicine

Subjects	Hour
Basic	156
Clinical	60

Clinical subjects

1)	Iron metabolism & ferrokinetics	7(hr.)
2)	Other organ function tests	14
3)	Tumor localization & organ visualization	14
4)	Radioisotope treatments(internal source)	3
5)	Radioisotope treatments (superficial & external source)	7
6)	Dilution analysis with R.I.	15
	Total	(60hrs.)

Table 10.

1) Status of overseas trainees specified the fields

Major fiield	Out	In
Engineering	74	46
Physics	69	39
Chemistry	51	34
Medicine	28(10.1%)	18(10.3%)
Biology	18	11
Electronics	16	9
Pharmacy	13	2
Agriculture	13	9
Health Physics	7	4
Others	4	3
Total	276	175

2) Status of overseas trainees training countries

(Medical field)

Country	No.
U. S. A.	14
West Germany	5
Japan	3
Italy	2
Australia	1
Philippine	1
Swiss	1
Thailand	1

Now I wish to mention about the status of the RI clinic in the hospital organization. As I have explained above, 9 hospitals have RI facilities, of which 3 hospitals put the RI clinic under the department of radiology, 5 under the department of internal medicine and I as a dependent clinic. Most of them, however, have no separated staffs or nurses.

Table 11. Status of technical assistance (IAEA)

1) Research contract

Year	No. of Contract		Total
	Newed	Renewed	
1962	1		$4,350
1963	3	1	$12,690
1964	2	2	$13,540
1965	3	5	$27,405
1966	2	6	$27,840
Grand Total	11	14	$85,825

2) Experts and euipments

Year	Experts	Total
1966	2 cases: (Waste disposal and R.I. products)	$10,000
1967	2 cases: (Activation analysis and labelled pharmaceuticals)	$12,500

In concluding, I would like to mention about the reasons why the application of RI in the medical field is relatively difficult in our country.

The instruments used in nuclear medicine are mostly expensive, therefore, the hospitals equipped with such instruments are inevitably limited in number and the after-service or repair of such instruments are technically not easy. The relatively high cost of the nuclides is also one of the reasons. The installation of generators has not yet been realized, hence, the short-lived isotopes of importance like Tc-99m are not easily available. Finally, adequate time is not alloted to nuclear medicine in the undergraduate course, namely, on an average 5 hours a year, maxmum 32hours and minimum 2 hours. This is a major reason why the physicians have only little knowledge about nuclear medicine.

Some of these difficulties, I hope, shall be overcome in the near future.