

Activities of *in vitro* laboratory of National Institute of Nuclear Medicine and Allied Sciences

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ABSTRACT

The *in vitro* laboratory of radioimmunoassay (RIA) Division is designed to provide clinical diagnostic service (e.g. hormone assay) and also to facilitate research works related to radioimmunoassay. The *in-vitro* laboratory is situated at the 9th floor of block-D of Bangabandhu Sheikh Mujib Medical University (BSMMU). Presently the *in-vitro* division of National Institute of Nuclear Medicine and Allied Sciences (NINMAS) has 18 man powers including doctors, radiochemists, officers, technologists and other laboratory staffs. The equipments used for RIA in *in vitro* laboratory are gamma counter, micropipettes, centrifuge, magnetic separators, vortex mixture, incubator/water bath, stirrers, deep freezer, refrigerator, pH Meter, analytical balance, test tubes and laboratory glassware etc.

A large number of samples are analyzed by the RIA Lab each week. In the year 2013 - 2014 (1st July 2013 – 30th June 2014), a total of 100 assays were done. A total of 25135 samples were assayed by RIA/IRMA in the *in vitro* lab. Results are reported on every Monday and Thursday of the week.

After careful consideration of the local infrastructure, robustness and cost of nuclear and non-nuclear assays, it is likely that RIA methodology will be the main workhorse of routine laboratory diagnostic services of NINMAS.

Key Words: NINMAS, In-vitro laboratory, Radioimmunoassay

INTRODUCTION

Institute of Nuclear Medicine was first established in 1980 on 1st and 3rd floor of Block-A of the former Institute of Post Graduate Medicine and Research (IPGMR). In 1982, the *in vitro* laboratory was started in the 1st floor. At that time thyroid and its related hormone T3, T4 and TSH were done manually. The kits were purchased from the Amersham International plc, Amersham UK. Very few samples <50 were done in a week. The

standards, samples, tracers and antibodies were pipette by micropipette and results were found out by counting in a scalar rate meter and plotting on a graph paper manually. Later on in 1984, a programmable calculator was used to find out the results. After that Dudley automatic gamma counter and then PC based Oakfield gamma counter & Berthold gamma counters were used.

In 2006 the institute was shifted in the newly constructed 18 storied Block-D of Bangabandhu Sheikh Mujib Medical University (BSMMU) with about 60,000 sft space comprising four floor levels (7th - 10th floor). The *in vitro* lab is now situated in the 9th floor of the Institute. The Institute in this newly constructed building was named as the Institute of nuclear medicine and ultrasound (INMU). The parameter of hormone estimation was increased by purchasing China Kits from 2005. Now about 20 hormones were estimated by using China kits. All hormones were done by RIA except TSH, which was done by IRMA. Now PC based RIA Counters (STRATEC – Germany) were used.

Along with the hormone radioimmunoassay, RBC life span, RBC mass, blood volume, sequestration study and vitamin B-12 malabsorption study were also done from 1985 in the *in-vitro* laboratory of the Institute. But due to unavailability of Cr-51 sodium chromate and Dicopac kits, at present the tests were not performed at NINMAS.

In 2013, automated RIA instrument using antibody coated tube kits, was introduced in the *in vitro* laboratory of National Institute of Nuclear medicine and Allied Sciences (NINMAS).

The *in vitro* laboratory is situated in the 9th floor of the newly constructed building of Block-D of

Bangabandhu Sheikh Mujib Medical University (BSMMU). The laboratory consists of two separate rooms, (Room No. - 1005 and 1012).

Most major items of equipment required for in-vivo function studies such as red blood cell (RBC) labeling, blood and plasma volume measurement and the Schilling test are available at In-vitro laboratories, *in-vivo* nuclear medicine units. These *in-vivo* procedures are carried out in sterile techniques.

Table 1: List of equipments of in the laboratory

Item	Description
Automated system	(Quantity: One)
a) Dispenser	Auto dispense up to 600 tubes, with Computers.
b) Stirrer	Stir 600 tubes at a time.
c) Washer	Aspirate/wash 20 tubes at a time continuously.
d) Gama Counter	Multiple auto, 10 Channels, with Computers.
Gamma counter	Multiple manual, 12 Channels, with Computers. (Quantity: Four)
Gamma counter	Single well manual. (Quantity: One)
RIA Pipettes and tips (µ Pipettes)	Semi-automatic, hand-held, 20 - 1000µl capacity. (Quantity: Ten)
Centrifuge	Refrigerated, for RIA tubes. (Quantity: Five)
Centrifuge	Normal, for blood separating. (Quantity: Two)
Stirrers	Two
Vortex mixture	Two
Magnetic separator	Ten
Incubator	For incubation of RIA tubes at 37°C. (Quantity: Five)
Water bath	6L capacity. (Quantity: One)
Deep freezer	Cupboard type, to -20°C. (Quantity: Three)
Refrigerator	Upright, (Quantity: Seven)
PH meter	General purpose type bench top with standard electrolytes. (One)
Analytical balance	Sensitive to 0.1 mg. (One)
Distilled water still	2 L/h capacity. (One)
Laboratory glass ware, test tubes etc.	

Table 2: Manpower in In-vitro division of NINMAS

Position	CMO	PSO	SSO	EO	JEO	SSA	SA-I	SA-II	LA	Daily basis
Number	1	1	1	3	1	2	3	3	2	1

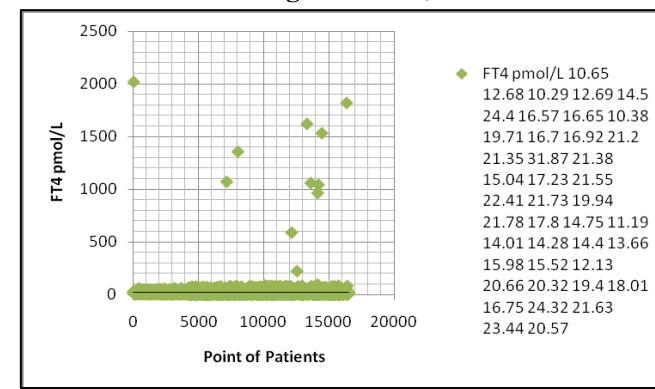
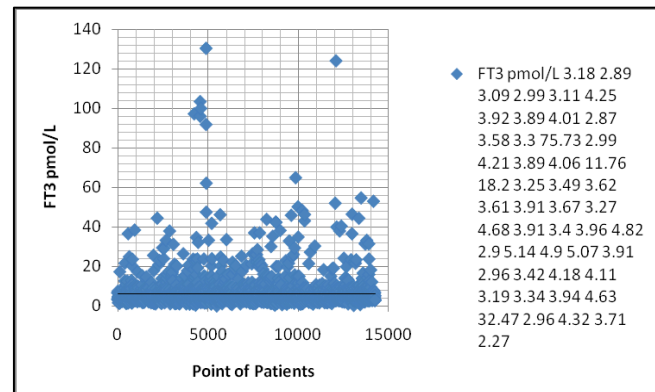
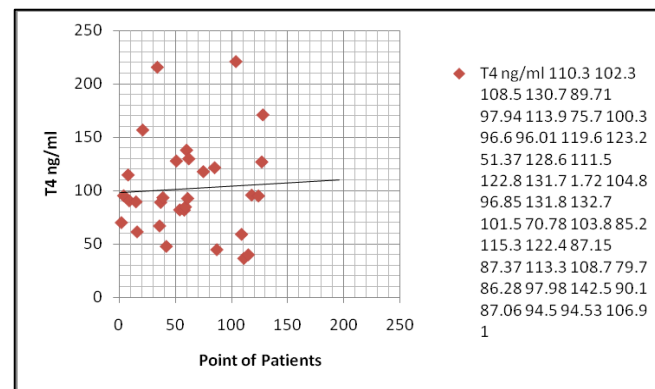
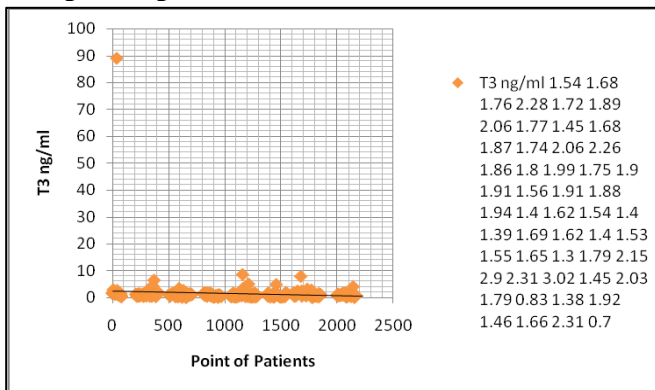
Table 3: Parameters a analyzed and their frequency

Hormone analyzed	T ₃ , T ₄ , TSH, FT ₃ , FT ₄	TG	TMAb, TGAb, TPOAb, LH, FSH, Testosterone, Progesterone, Prolactin, Estradiol, PSA, Calcitonin, Cortisol, PTH
No. of assays per week	Three	Four	One

Table 4: No of patients analyzed for individual Assays (2013-2014)

Total Assay	Total Patients	Individual Patients					
		T ₃ 3884	T ₄ 4617	FT ₃ 5463	FT ₄ 11685	TSH 23055	TG 4112
		TMAb 6	TGAb 25133	TPOAb 1102	LH 618	FSH 648	Testosterone 359
		Progesterone 31	Prolactin 688	Estradiol 123	PSA 42	Cortisol 54	PTH 42

Graphical presentation:



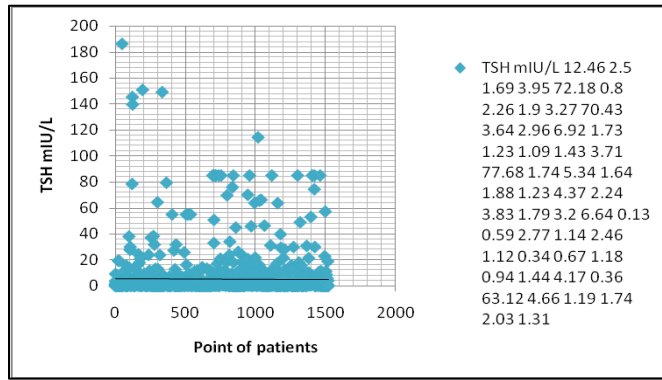


Figure 5. TSH

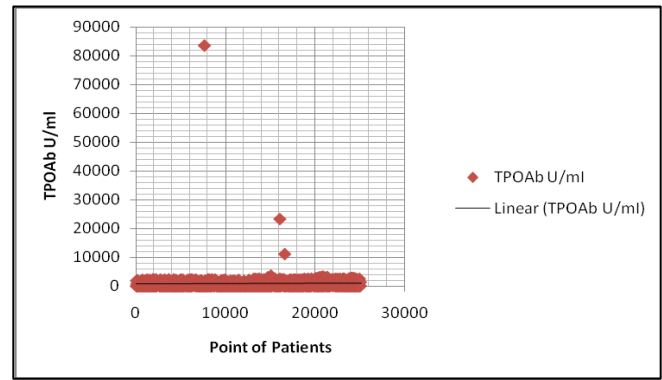


Figure 9. TPOAb

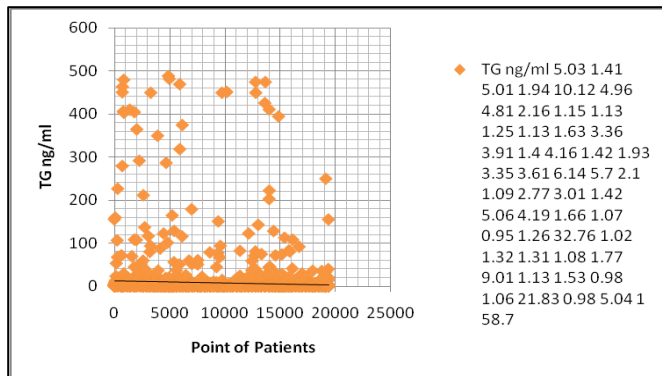


Figure 6. TG

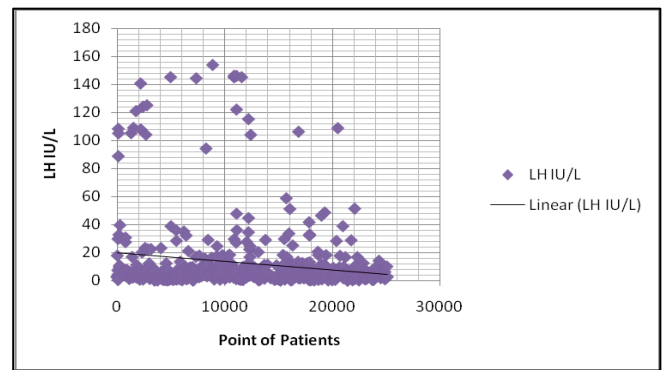


Figure 10. LH

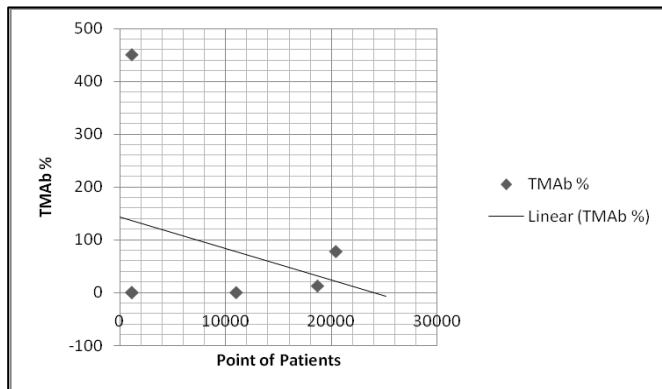


Figure 7. TMAb

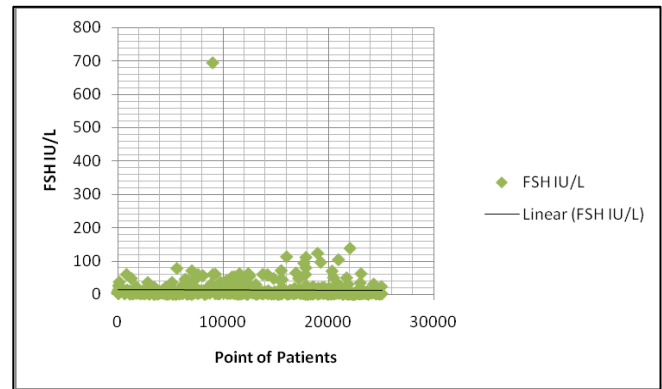


Figure 11. FSH

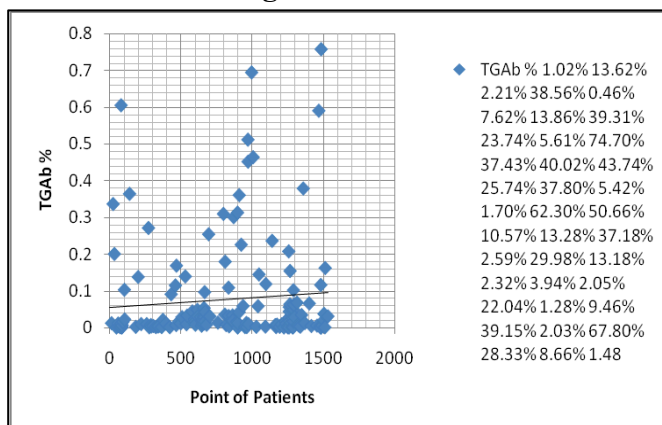


Figure 8. TGAb

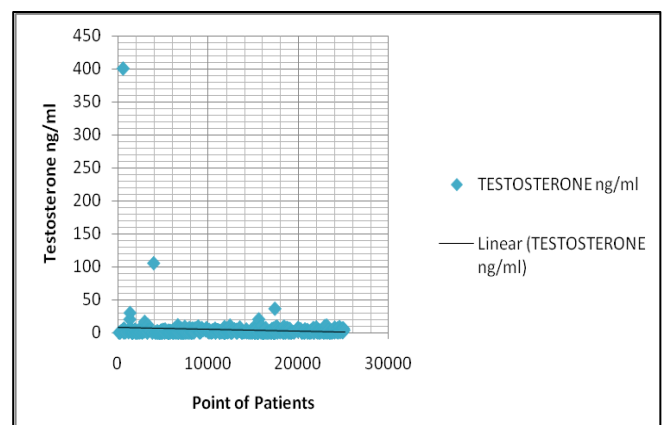


Figure 12. Testosterone

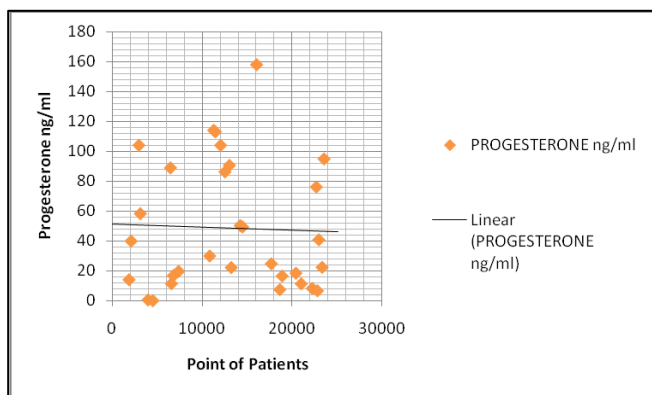


Figure 13: Progesterone

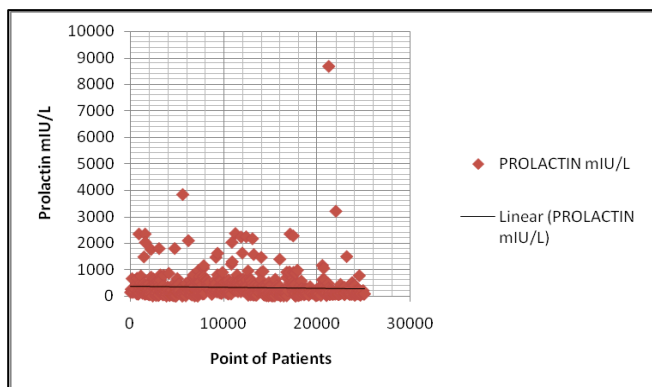


Figure 14: Prolactin

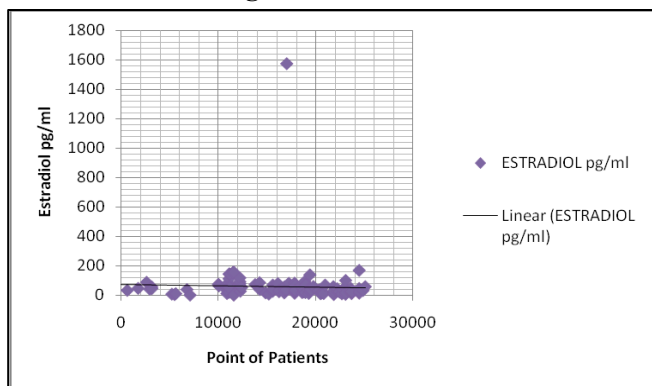


Figure 15: Estradiol

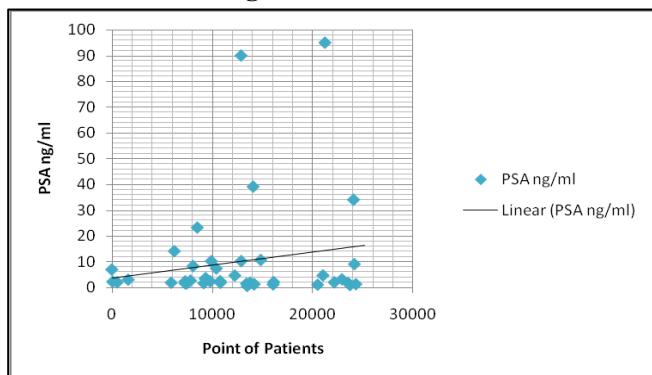


Figure 16: PSA

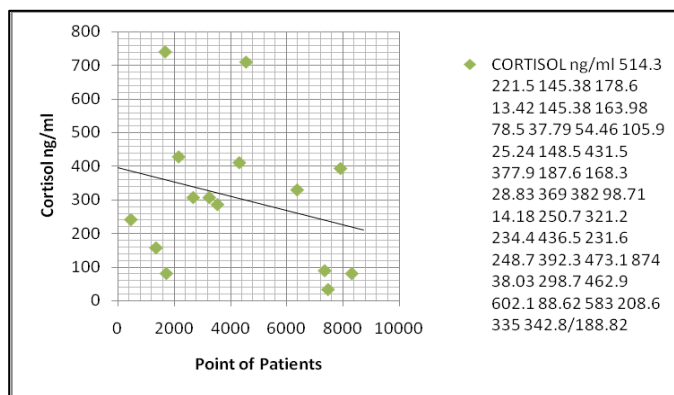


Figure 17: Cortisol

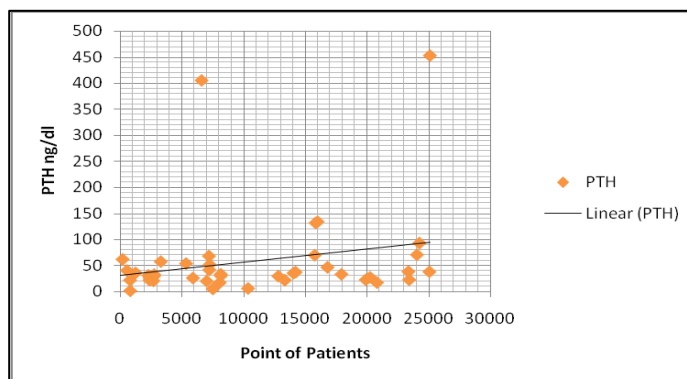


Figure 18: PTH

DISCUSSION

A fair number of samples are analyzed in the RIA lab each week. Results are reported on every Monday and Thursday of the week. The patient's blood samples are collected every day. The collection of Sunday and Monday are reported on next Monday and collection of Tuesday to Thursday are reported on next Thursday. Every batch was reported as a single assay including all hormone assays. In the year 2013 – 2014 from 1st July 2013 to 30th June 2014 a total of 100 assays results were reported including all hormones. Total of 25135 patient's 18 tests were done, of which T3 of 3884 pts, T4 of 4617 pts, FT3 of 5463 pts, FT4 of 11685 pts, TSH of 23055 pts, TG of 4112 pts, TMAb of 6 pts, TGAb of 25133 pts, TPOAb of 1102 pts, LH of 618 pts, FSH of 648 pts, Testosterone of 359 pts, Progesterone of 31 pts, Prolactin of 688 pts, Estradiol of 123 pts, PSA of 42 pts, Cortisol of 54 pts and PTH of 42 pts. See Table 4 for detail.

Graphs are plotted as point of patients on X-axis and hormone values on Y-axis. When the need arises, the RIA lab is also available for the performance of assays for research purposes.

CONCLUSION

After careful consideration of the local infrastructure, robustness and cost of nuclear and non-nuclear assays, it is likely that RIA methodology will be the main workhorse of routine diagnostic services. RIA will be used as the reference method to solve problems generated by

non-isotopic immunoassay. With the use of modular robotic systems and improved antibody design for short incubation assay, RIA may be modularly automated to reduce further operating cost. It will be suitable for the nationwide screening of congenital diseases and other disorders.

REFERENCES

Nuclear Medicine Resources Manual. International Atomic Energy Agency, VIENNA, 2006; 76 – 81.