ON THE RELATIONSHIP BETWEEN WHOLE BODY, EXTREMITY RING AND EYE LENS DOSES FOR MEDICAL STAFF IN THE PREPARATION AND APPLICATION OF NUCLIDES IN NUCLEAR MEDICINE

Renata Kopeć, M. Budzanowski

Laboratory of Individual and Environmental Dosimetry
Institute of Nuclear Physics Polish Academy of Sciences, Krakow, Poland

A. Wyszomirska[2,3], J. Sowinski[2], R. Czepczynski[2,3]

[2] Department of Endocrinology and Department of Surgery, University of Medical Sciences, Poznan, PL
[3] PET/CT Centre, Euromedic Diagnostics, Poznan, Poland

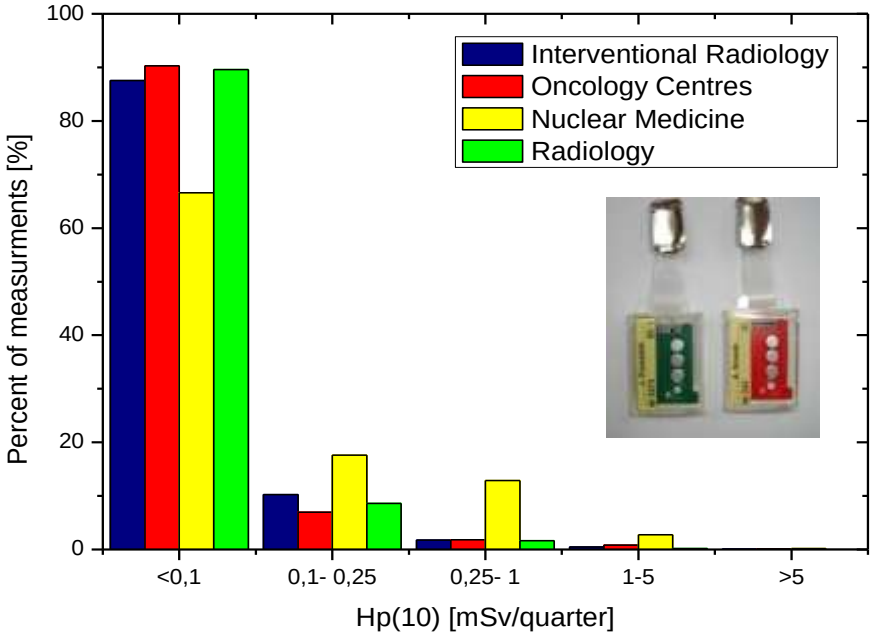
A. Budzyńska[4], M. Dziuk[4]

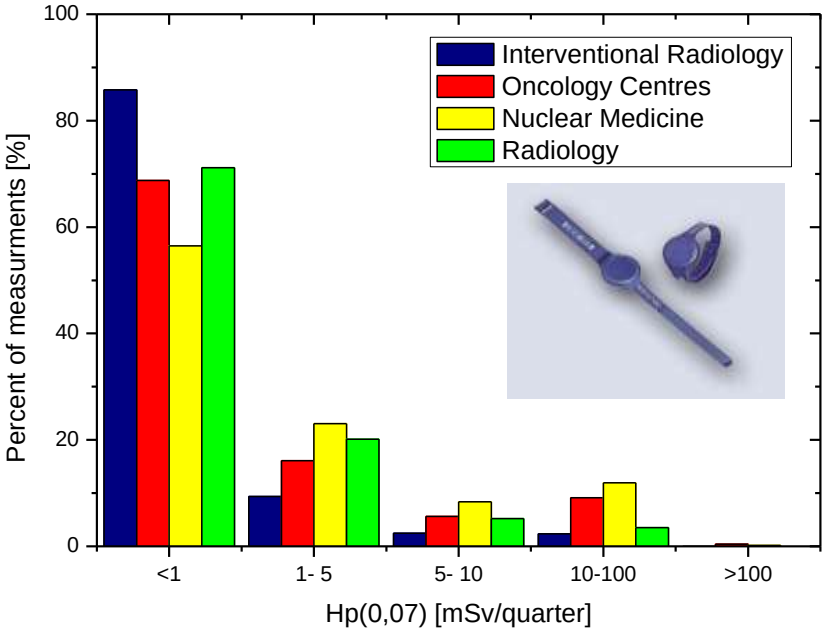
[4] Mazovian PET/CT Centre, Euromedic Diagnostics, Warsaw, Poland

Introduction

Situation:

➢35-45% of individual doses in nuclear medicine exceed the natural radiation background (based on our experience);





Percentage of quarterly measurements of occupational doses for different kinds of medical staff as a function of Hp(10) (left) and as a function of Hp(0.07) (right).

Introduction

Situation:

➢35-45 % of individual doses in the nuclear medicine exceed the natural radiation background (based on our experience);

➢ all types of exposure significant - Hp(10), Hp(3) and Hp(0.07);

The aim of the work:

To investigate the relationship between Hp(10), Hp(3) and Hp(0.07) in the nuclear medicine using 3 types of different individual dosemeteres with the TL detectors during normal procedures.

Medical staff doses

The doses to medical staff were measured in terms of:

- Hp(10): the personal dose equivalent for whole body;
- Hp(3): the personal dose equivalent for eye lens;
- Hp(0.07): the personal dose equivalent for fingers.

MCP-N (LiF: Mg,Cu,P) thermoluminescence detectors:
4.5 mm in diameter
0.9 mm thickness

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Standard RADOS Oy dosemeter

dosemeters elements

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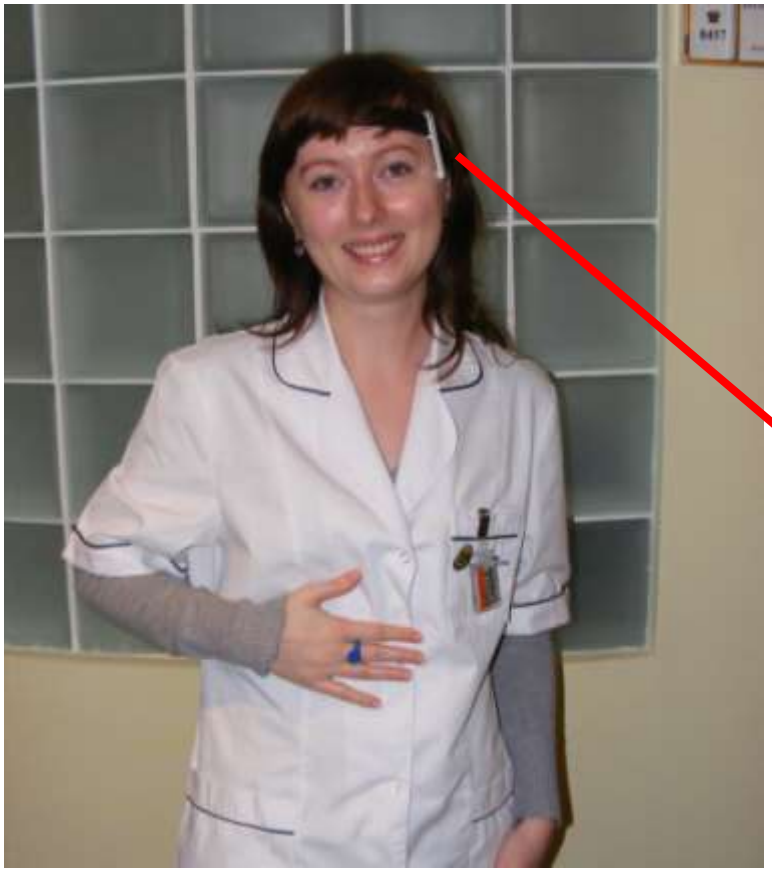

Eye lens dosemeter (protoype-developed by RADCARD in the frame ORAMED project)

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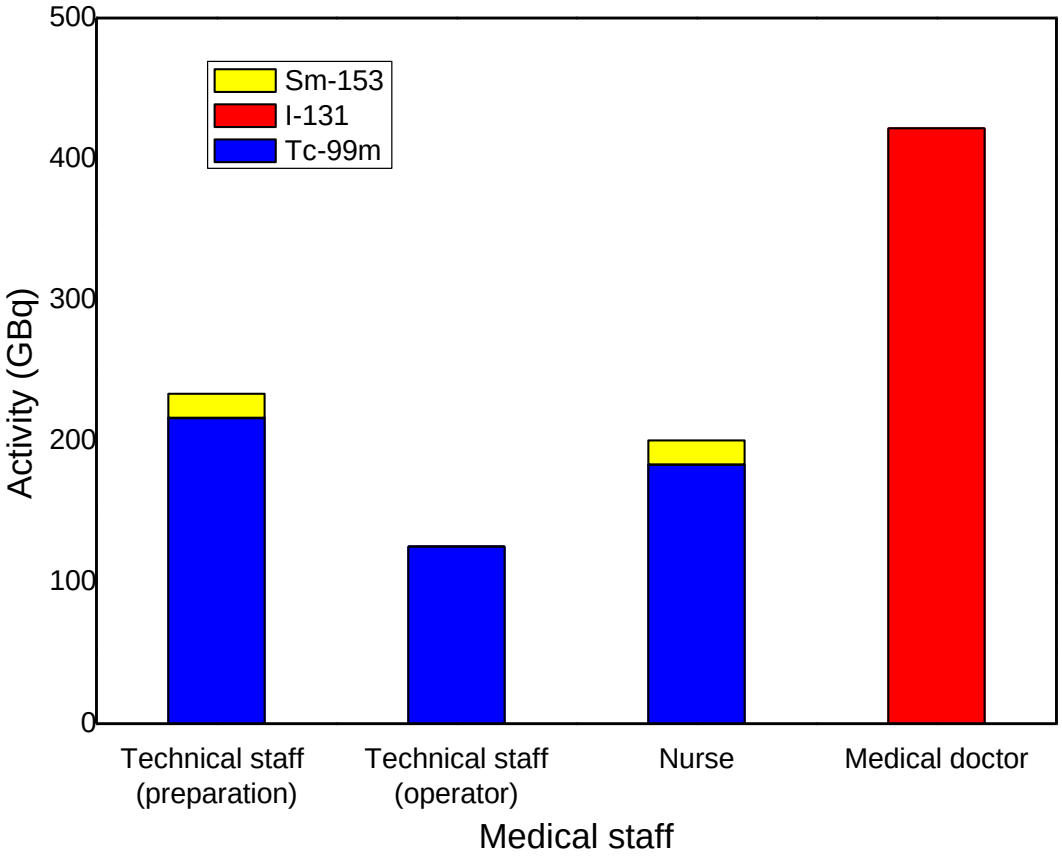
extremity ring

Medical staff in department of scintigraphy

Medical staff	Isotope	Activity [GBq]
Technical staff (preparation)	Tc-99m	216.6 (619.2*)
	Sm-153	17.0
	I-131	0.2
Technical staff (operator)	Tc-99m	125.4
	I-131	0.15
Nurse (541 patients)	Tc-99m	183.6
	Sm-153	17.0
	I-131	0.15
Medical doctor (364 patients)	I-131	421.8

Activities of handling radioactive nuclides used for conventional diagnostic purposes during this studies.

Medical staff in department of scintigraphy



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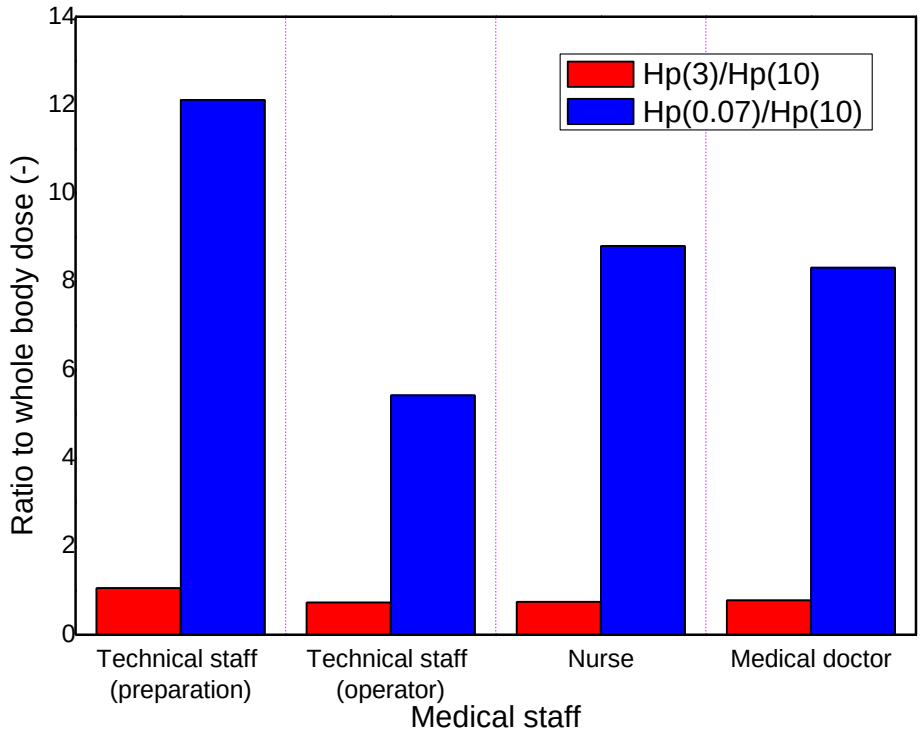
Doses in department of scintigraphy

Medical staff	Hp(10) [µSv/GBq]	Hp(3) [µSv/GBq]	Hp(0.07) [µSv/GBq]
Technical staff (preparation)	3.3	3.5	39,4
Technical staff (operator)	1.4	1,0	7,3
Nurse	3.4	2,5	29,8
Medical doctor	1.2	0,9	9,9

- Technical staff (preparation) and nurses received the highest doses;
- Hp(0.07) were higher than Hp(10) by a factor 5 to 12;
- Measurments Hp(3) were gave comparable results with Hp(10);

Doses in department of scintigraphy



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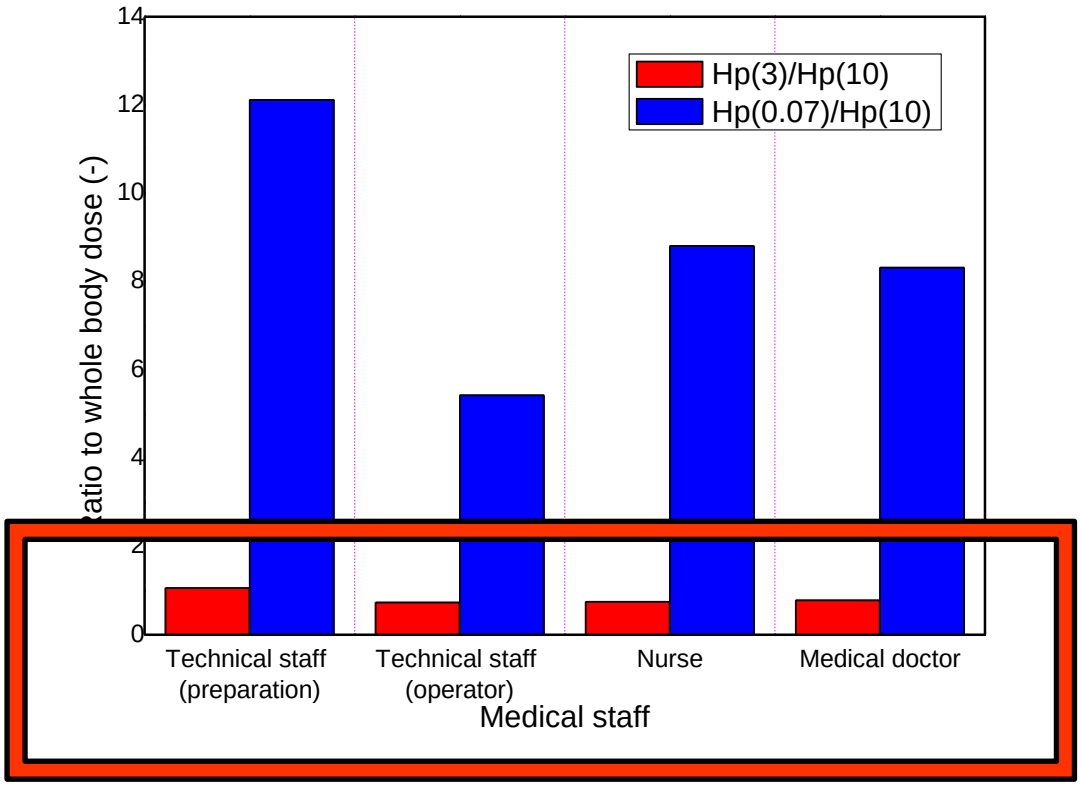
Doses in department of scintigraphy



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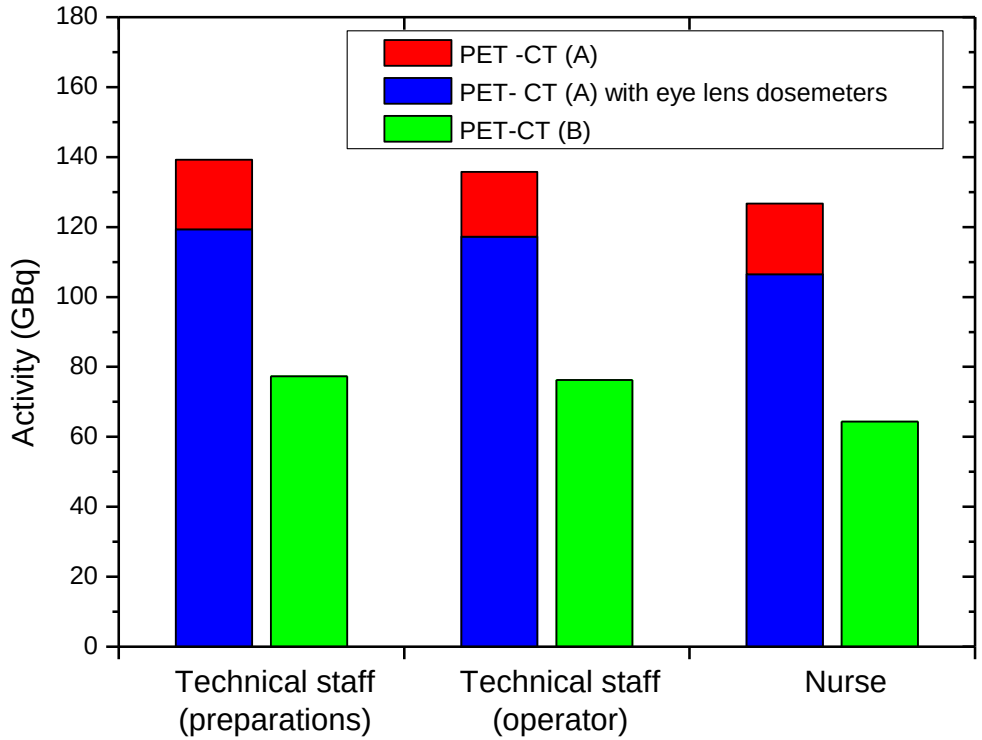
Medical staff in PET-CT centres

Medical staff	Isotope	Procedures in PET- CT centre	
		A	B
Technical staff (preparation)	F-18	400 (343*)	209
Technical staff (operator)	F-18	390 (337*)	206
Nurse (administration)	F-18	364 (306*)	174

* Number of procedures with eye lens dosemeters

Averange activity F-18 per one procedure during this studies:
-in A PET-CT centre 0.348 GBq
-in B PET-CT centre 0.37 GBq

Medical staff in PET-CT centres



To PET- CT centres were measured:
- Centre A : activity per one procedure: 0.348 GBq
- Centre B: activity per one procedure: 0.37 GBq

Doses in PET- CT centres

Comparison between
A and B PET-CT centres:

Medical staff	Hp(10) [µSv/GBq]		Hp(3) [µSv/GBq]		Hp(0.07) [µSv/GBq]	
	A	B	A	B	A	B
Technical staff (preparation)	1.2	13.0	1.2	3.0	-	407.5
Technical staff (operator)	1.5	6.4	1.1	6.1	2.0	27.5
Nurse	3.7	7.6	3.3	-	41.9	39.8

- **Doses in centre B >> A;**

Reasons:
-lead apron was used only in centre A (Hp(10));
-better expertise and procedures in centre A;

- Ratio Hp(3)/Hp(10) higher in centre A than in centre B

Reason: wrong placement eye lens dosemeter;

All procedures with lead apron

No procedures with lead apron

Doses in PET- CT centres

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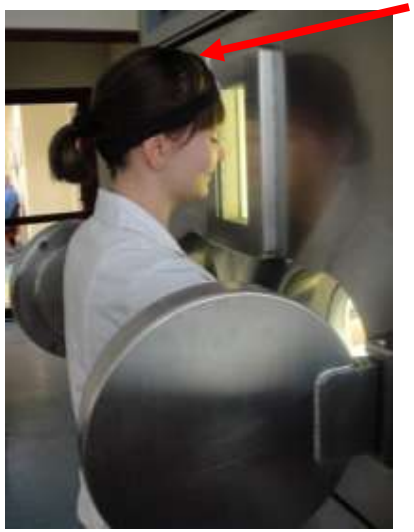

Conclusions

- The occupational exposure of staff in nuclear medicine can vary significantly for different departments and workers.

- Good practise and the optimization procedures of tracking patients, allowing a shorter duration of the contact between the medical staff and the radionuclides.

- Placing of the eye lens dosemeter was significant.

- Extremity doses should be performed for occupational medical staff in nuclear medicine.

Question: Could we estimate Hp(3) in nuclear medicine from measurements of Hp(0.07) and Hp(10) exploiting knowledge of workplace field?

For annual limit 150 mSv/y – (probably) yes, but some training and practical radiation protection measures are still needed.

Thank you for your attention!