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ESTIMATION OF ^{99m}Tc LEVELS IN URINE SAMPLES FOR NUCLEAR MEDICINE WORKERS

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Introduction

One of the biggest hazards working in a department of nuclear medicine is the possibility of long-term exposure effects to low-level radiation that provokes certain biological effects.

To be sure that internal contamination is not exceeding the accepted limits, various dosimetrical techniques could be used. For example, in vitro tests of urine samples are often used for individual monitoring of internal occupational exposure, especially for volatile radionuclides [1].

Individual monitoring of internal exposure to short-lived radionuclides could be challenging, because these radionuclides rapidly vanish from the body. That is why quantitative dosimetry addressing the internal doses from the short-lived radionuclides is often overlooked

1. Al-abdulsalam A., Brindhaban A. Occupational Radiation Exposure among the Staff of Departments of Nuclear Medicine and Diagnostic Radiology in Kuwait. Med Princ Pract. Vol. 23, No. 2, 2014, p.129-33.

The aim

The aim of this work was to analyse detection of ^{99m}Tc radionuclide in urine samples for nuclear medicine department personnel, using gamma spectrometry.

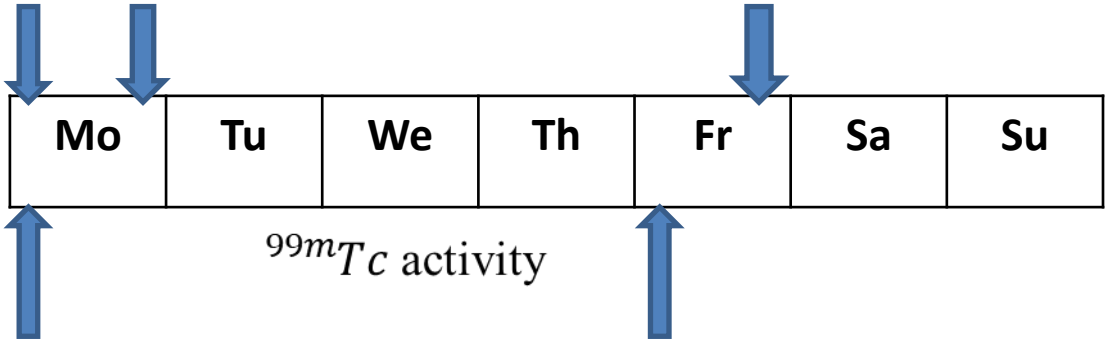
Methods

- We analyzed 12 urine samples per 4 weeks.
- 10 g of each urine sample were poured into test-tubes.
- Spectrum measurements lasted for 100 000 s.
- Counts per minute (CPM) were recalculated into integrated specific activity using formula:

$$A = \frac{CPM}{60s} \cdot m\ [Bq/kg]$$

Fig. 1. Gamma spectrometer "CompuGamma 1282" spectrometer

Schedule of Urine samples



Results

Table 1. Activity of ^{99m}Tc taken from technetium–molybdenum generator per 4 weeks.

Weeks	Activity on Monday, MBq	Activity on Friday, MBq	Total activity/5 days, MBq
1	8520	2800	29820
2	8340	2700	25190
3	8430	2670	25450
4	8460	2760	25430
Average activity, MBq	8437.5	2732.5	26472.5

Results

Table 2. Activity of ^{99m}Tc in urine sample and empty tube radiation registered on Monday before and after work

Weeks	Monday (before work)	Monday (after work)
	Integrated specific activity, [mBq/kg]	Integrated specific activity, [mBq/kg]
1	97	128
2	94	125
3	94	125
4	95	126
Average values	95	126
Empty tube	0	

Results

Table 3. Activity of ^{99m}Tc in urine sample and empty tube radiation registered on Monday before and after work and on Friday after work

Weeks	Monday (before work)	Monday (after work)	Friday (after work)
	Integrated specific activity, [mBq/kg]	Integrated specific activity, [mBq/kg]	Integrated specific activity, [mBq/kg]
1	97	128	98
2	94	125	93
3	94	125	95
4	95	126	94
Average values	95	126	95
Empty tube	0	0	0

Results

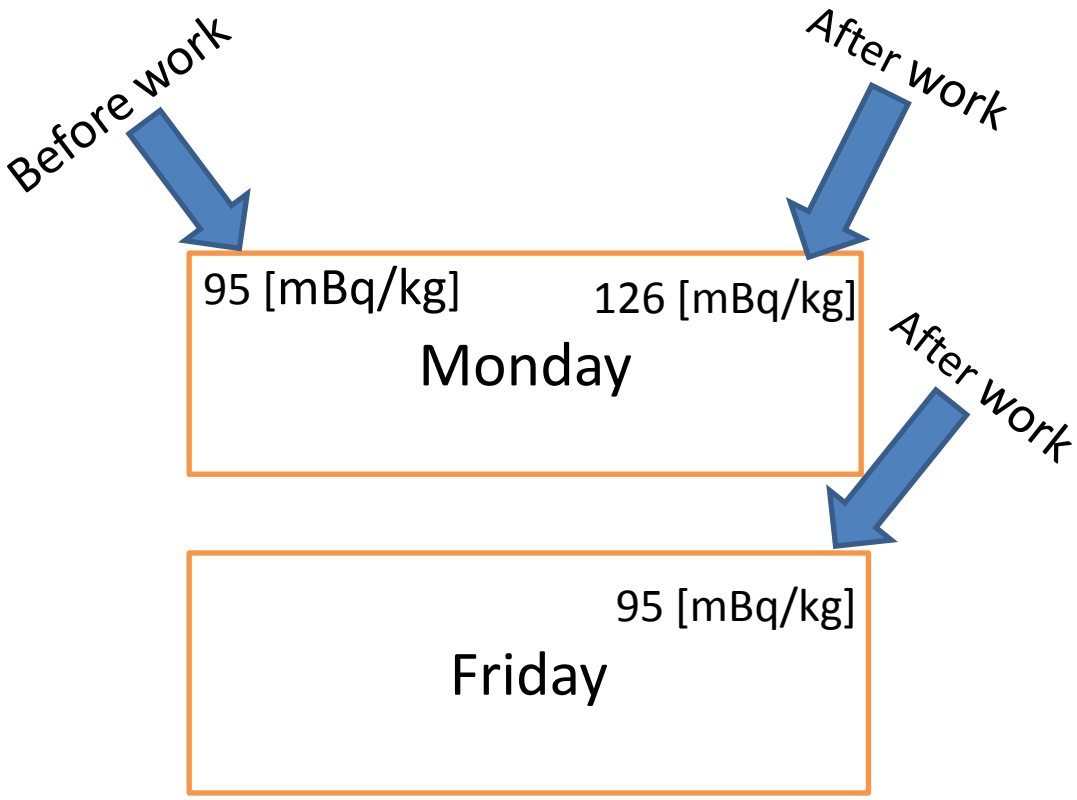


Fig. 2. Average ^{99m}Tc integrated specific activity.

Conclusions

1. Registered activities of ^{99m}Tc on Mondays before work and after work showed a slight increase of integral specific activity (from 95 to 126 mBq/kg), while on Fridays after work no significant changes were registered in compare with measurements made on Mondays (95 mBq/kg), it could be related to the lower activity of of ^{99m}Tc taken from technetium–molybdenum generator.
2. ^{99m}Tc is not a volatile and short-term radionuclide, according to this we registered too low "activities" in worker's urine samples, so it is not recommended to use this method as a dosimetry or routine monitoring for ^{99m}Tc radionuclide.

Thank you for your attention!