



GROUPING OF NM EXAMINATIONS AND DESIGN OF A SURVEY OF FREQUENCY OF NM EXAMINATIONS + CONVERSION TO EFFECTIVE DOSE

Contract ENER/2010/NUCL/SI2.581237

**Study on European Population Doses
from Medical Exposure (Dose Datamed 2)**

Training course, Sofia
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RP 154

**ANNEX 2 – Dose Dated
Report 1a
REVIEW OF NATIONAL
SURVEYS OF POPULATION
EXPOSURE FROM **NUCLEAR
MEDICINE** EXAMINATIONS
IN EIGHT EUROPEAN
COUNTRIES**



EFFECTIVE DOSES FROM NM EXAMINATIONS

- Data to be collected:
 - Procedure
 - Radionuclide
 - Chemical form
 - Mean activity
 - Number of procedures
- Conversion factors (mSv/MBq) from ICRP Reports



$E = \text{average activity} \times \text{conversion factor}$



EXAMPLE OF A DOSE COLLECTION

1. Diagnostic nuclear medicine procedures, adults 2006

| Procedure | Radio-nuclide | Chemical form | Mean activity (MBq) | Number of procedures 2006 |
|--|---------------|----------------------------|---------------------|---------------------------|
| Gamma- and SPECT | | | | |
| Brain imaging | Tc-99m | Phosphates or phosphonates | | |
| Cerebral blood flow | Tc-99m | HMPAO | | |
| Cerebral blood flow | Tc-99m | ECD | | |
| Brain receptor imaging | I-123 | beta-CIT (karbometoxy- | | |
| Brain receptor imaging | I-123 | DaTSCAN (FP-CIT) | | |
| Brain receptor imaging | I-123 | Nor-b-CIT | | |
| Brain receptor imaging | I-123 | Epideprid | | |
| Brain receptor imaging | I-123 | NNC | | |
| Brain receptor imaging | I-123 | IBZM (iodidebenzamidi) | | |
| Brain SPECT | Tc-99m | | | |
| Lymphoscintigraphy | | | | |
| Thyroid imaging | Tc-99m | pertechnetate | | |
| Thyroid imaging | I-123 | iodide | | |
| Thyroid imaging | I-131 | iodide | | |
| Parathyroid imaging, using 1 radionuclide | Tc-99m | MIBI | | |
| Parathyroid imaging, using 2 radionuclides | Tc-99m, I-123 | MIBI, iodide | | |



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Radiation Dose to Patients from Radiopharmaceuticals



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Addendum 2 to ICRP Publication 53

Also includes Addendum 1 to
ICRP Publication 72



Pergamon



ICRP Publication 106: Radiation Dose to Patients from Radiopharmaceuticals A Third Adendum to ICRP Publication 53

- Published February 2009
 - Effective doses for radiopharmaceuticals (mSv/MBq): ¹¹C-acetate, ¹¹C-amino acids, ¹¹C-brain receptor substances, ¹¹C-methionine, ¹⁸F-amino acids, ¹⁸F-FET, ¹⁸F-FDG, ¹¹¹In-monoclonal antibodies/fragments, ¹²³I-fatty acid (BMIPP, IPPA), ¹²³I-monoclonal antibodies/fragments, ¹³¹I-monoclonal antibodies/fragments, and ²⁰¹Tl-ion
- ICRP 80, from 1998



EXAMPLE OF A CONVERSION FROM ACTIVITY TO DOSE

BRAIN PERFUSION GAMMA IMAGING/ Tc-99m-HMPAO 2009

| Hospital/ laboratory | Radionuclide/ chemical form | Average activity (MBq) | Number of procedures | Used activity (MBq) |
|-------------------------|--------------------------------|------------------------------|-------------------------|------------------------|
| Hospital 1 | Tc-99m/HMPAO | | 22 | 0 |
| Hospital 2 | Tc-99m/HMPAO | 900 | 58 | 52200 |
| Hospital 3 | Tc-99m/HMPAO | 370 | 3 | 1110 |
| Hospital 4 | Tc-99m/HMPAO | 740 | 19 | 14060 |
| Hospital 5 | Tc-99m/HMPAO | 700 | 25 | 17500 |
| Hospital 6 | Tc-99m/HMPAO | 700 | 2 | 1400 |
| Hospital 7 | Tc-99m/HMPAO | 740 | 4 | 2960 |
| Hospital 8 | Tc-99m/HMPAO | 740 | 3 | 2220 |
| Hospital 9 | Tc-99m/HMPAO | 740 | 1 | 740 |
| 9 | | 703,75 | Total | Total |
| | | | 137 | 92190 |

| | | |
|--------------|-----------------------|----------------|
| | smallest activity | 370 |
| | biggest activity | 900 |
| | activity/procedure | 673 |
| Tc-99m-HMPAO | dose mSv/MBq | 9,3E-03 |
| | dose/procedure. (mSv) | 6,26 |
| | total dose (mSv) | 857 |

←

$$\frac{\text{Total used activity}}{\text{Number of procedures}}$$



NM TOP 5 in Finland in 2006

| Examination/ nuclide and chemical form | Number of examinations | Average effective dose per examination (mSv) | Collective effective dose (mSv) | Proportion of collective effective dose (%) |
|---|------------------------|--|---------------------------------|---|
| Bone imaging Tc-99m phosphate and phosphonate | 12688 | 3,7 | 46637 | 29,2 |
| Myocardial perfusion Tl-201 chloride | 1 017 | 24,2 | 24561 | 15,4 |
| Myocardial perfusion Tc-99m tetrofosmin | 2 820 | 7,6 | 20898 | 13,1 |
| Whole body PET/18F-FDG | 761 | 7,0 | 5350 | 3,3 |
| Brain dopamine transmitters 123I-β-CIT | 580 | 8,8 | 5102 | 3,2 |



Thank you!