

# Application of ALARA Principles in Manipulation Radiopharmaceuticals

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The system dealing with the whole procedure of manipulation with radiopharmaceuticals has been introduced. This system results from the patented principle of batching of radioactive solutions without turning up the vials (Pat.Nr.293283)

The described process begins at the point of admission the activity into a controlled area of Nuclear Medicine Department, comprises all steps of manipulating cycle, including batching with simultaneous measuring of withdrawn activity and ends with wastes handling procedures. The system presented differs by used materials and shield thickness in accordance to type of radiopharmaceuticals being processed. Up to 24 mm of tungsten layer is used to shield FDG, while minimum 8 mm of acrylic glass for <sup>90</sup>Y - for example Zevalin - can be acceptable. 6 mm of lead is used to protect the stuff against the irradiation while handling <sup>99</sup>Tc. The optimized protection is provided not only against a whole body irradiation but also a special attention has been paid to reduce sometimes underestimated fingerdoses. The direct contact of fingers with elements containing radioactive solutions as well as penetration of irradiation in the sphere of movement of hands have been eliminated thoroughly by design of used devices and correct organization of working steps. The system as an organized procedure of single operations defines exactly the position of each simple shielding device by means of mechanical elements thus minimizing the risk of the both radionuclide and bacteriological contaminations. Because time is an effective means of irradiation protection all manipulation steps are organized to take only seconds.

The control of radiochemical purity of radiopharmaceuticals has been included into a manipulating procedure in order to save time and to improve its results. An important part of the whole advancement is the transport of radioactive solutions from the laboratory, where the doses for patient are prepared to the administration room or place.

In order to make the manipulation safe and easy another subsidiary devices have been included e.g. administrating tables equipped with shielded wastes containers etc. The waste handling procedure during preparation and administration of radiopharmaceuticals has been defined.

Processed activity in radiopharmaceutical laboratory in 2005 : <sup>99m</sup>Tc 12 000 GBq to 13 000 GBq, <sup>111</sup>In 6 000 MBq, <sup>123</sup>I 9 000 MBq, <sup>153</sup>Sm 5 500 MBq, <sup>90</sup>Y 7500 MBq. Irradiation of the stuff (two persons) was following: Effective dose less than 2 mSv/year and equivalent dose on hands less than 18 mSv/year.