

A cross-calibration method for determining calibration factors for containers used in the hospital environment

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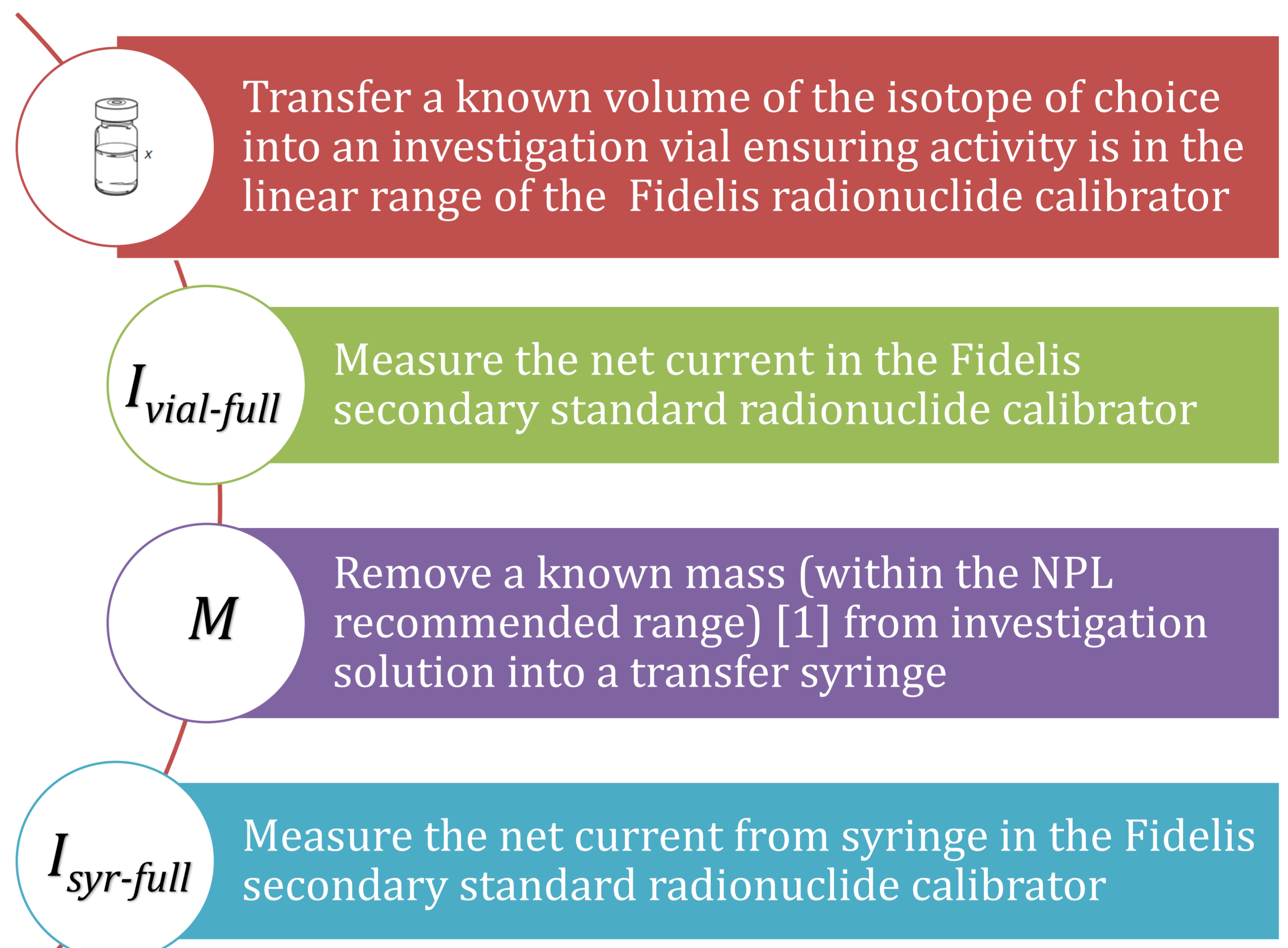
Introduction

- Calibration factors for the Fidelis secondary standard [1] are available for
 - 10R Type 1+ Schott vials
 - Amersham P6 vials
 - BS ampoules
- Radiopharmaceuticals for hospital use are rarely supplied in any of these containers and the containers vary between manufacturers and products

Aim

- Develop a cross-calibration method between 10R Type 1+ Schott and other vial types to allow accuracy measurements to be undertaken in the hospital environment
- Determine a calibration factor for General Electric (GE) DaTSCAN vials containing ¹²³I

Methods



Methods (continued)

- Masses/volumes were calculated by weight pre- and post dispensing
- Volume corrections were performed based on [1]

$$I_0/I_m = a_2 \times (m - m_0)^2 + a_1 \times (m - m_0) + 1$$
 where I_0 is the expected current at the nominal mass ' m_0 '
 I_m is the measured current at an individual mass ' m '
 a_1 and a_2 are volume correction factors
- The technique was validated using ⁹⁹Tc^m
 - in a 10R Type 1+ vial for which a factor exists [1]
- The technique was then applied to ¹²³I
 - in a GE DaTSCAN vial

Results

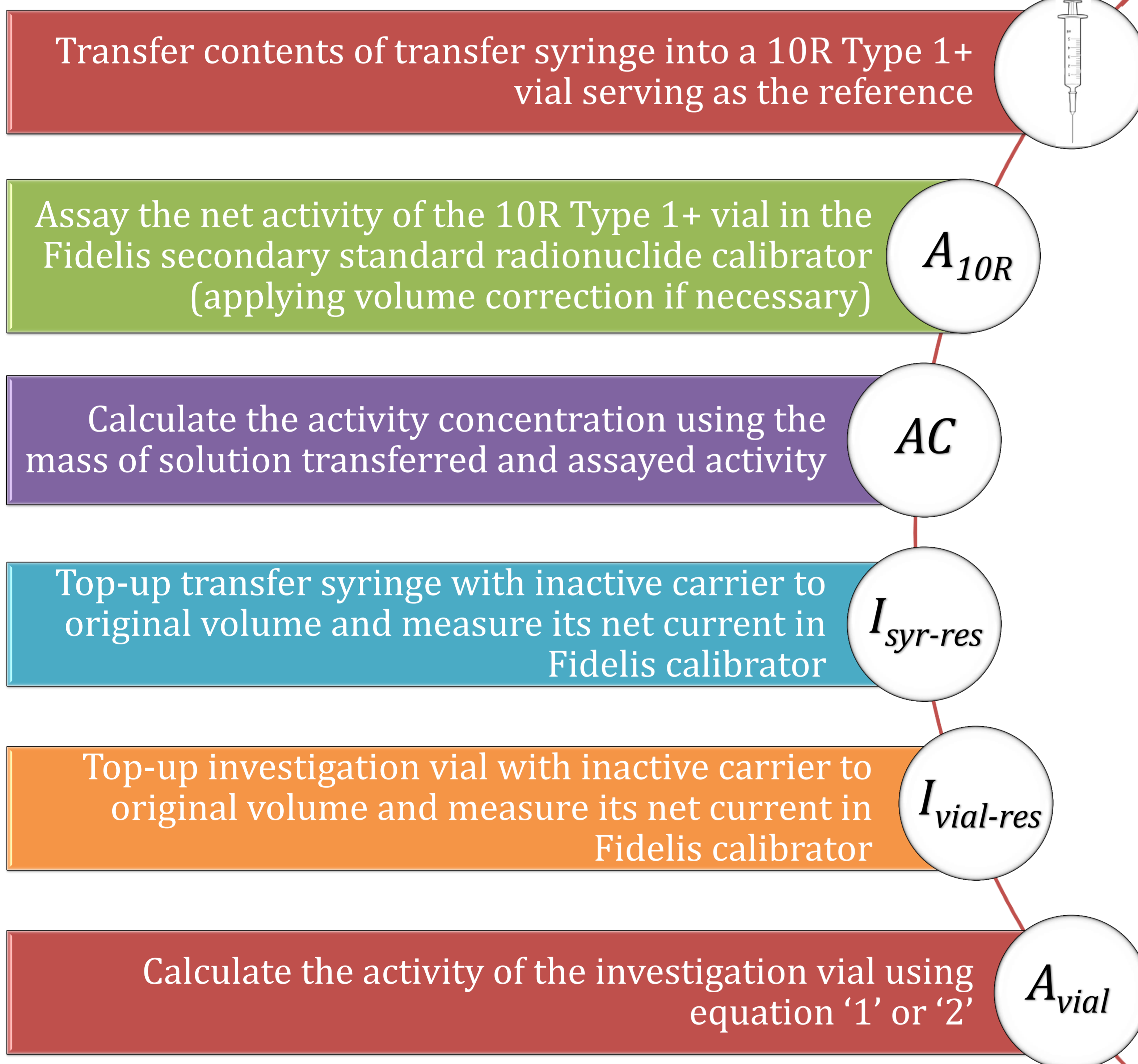
Method Validation with ⁹⁹ Tc ^m		
Expected Activity (MBq)	56.38 ± 0.46	
Equation Used	'1'	'2'
Measured Activity (MBq)	56.45 ± 0.58	55.88 ± 0.60
Difference (%)	0.1	-0.9

Calibration Factor for ¹²³ I (GE DaTSCAN vial)		
NPL Factor [†] (pA/MBq)	1.721 ± 0.015	
Equation Used	'1'	'2'
Measured Factor (pA/MBq)	1.584 ± 0.016	1.582 ± 0.016
Difference (%)	-8.0	-8.1

[†] for a 10R Type 1+ vial

Conclusion

- Cross-calibration of vials against 10R Type 1+ vials is feasible in the hospital environment



$$A_{vial} = \frac{A_{10R}}{\left(1 - \frac{I_{syr-res}}{I_{syr-full}}\right) \times \left(1 - \frac{I_{vial-res}}{I_{vial-full}}\right)} \quad (eq. 1)$$

$$A_{vial} = \frac{AC \times M}{1 - \frac{I_{vial-res}}{I_{vial-full}}} \quad (eq. 2)$$

NB activities/currents all decay-corrected to a common reference time

References

- NPL Calibration factors for the NPL 'Fidelis' Secondary Standard Radionuclide Calibrator. Version 2, Issued 20/02/2012.