

Use of finger prick sampling to monitor immunosuppressant drug levels in transplant patients

Brian Keevil

Wythenshawe hospital

Cyclosporin Publication: Ther Drug Monit, 24, (2002) 757-767

Therapeutic Drug Monitoring
24:757-767 © 2002 Lippincott Williams & Wilkins, Inc., Philadelphia

Simultaneous and Rapid Analysis of Cyclosporin A and Creatinine in Finger Prick Blood Samples Using Liquid Chromatography Tandem Mass Spectrometry and Its Application in C2 Monitoring

Brian G. Keevil,* David P. Tierney,* Donald P. Cooper,† Michael R. Morris,† Ali Machaal,‡ and Nizar Yonan‡

**Department of Clinical Biochemistry and ‡Transplant Unit, Wythenshawe Hospital, Manchester, United Kingdom; and †Clinical Applications Group, Micromass UK Ltd, Manchester, United Kingdom*

Summary: A simple and rapid liquid chromatography tandem mass spectrometry (LC-MS/MS) method for the simultaneous analysis of cyclosporin A (CsA) and creatinine using capillary blood has been developed. Venous and capillary blood samples were taken predose and at C₂ from 65 heart and lung transplant recipients (65 × 4



Tacrolimus Publication: Ann Clin Biochem (2002), 39, 487- 492.

Original Article

Evaluation of a rapid micro-scale assay for tacrolimus by liquid chromatography-tandem mass spectrometry

BG Keevil¹, SJ McCann¹, DP Cooper² and MR Morris²



Abstract

Addresses

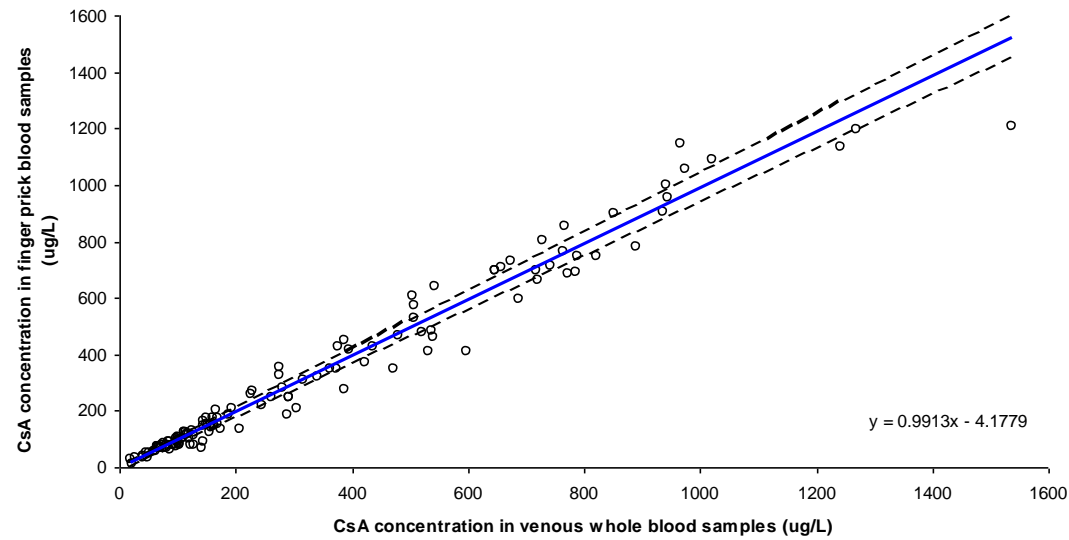
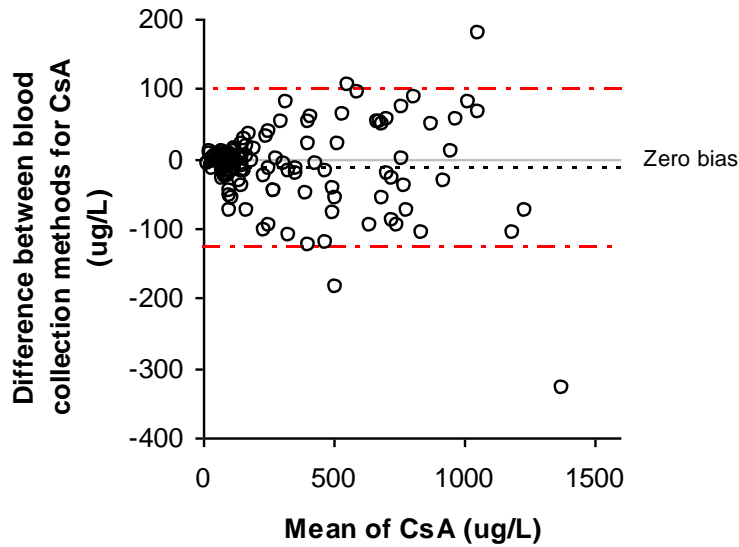
¹Department of Clinical Biochemistry
Wythenshawe Hospital
South Manchester University
Hospitals NHS Trust
Southmoor Rd
Manchester M23 9LT
UK

²The Clinical Applications Group
Micromass UK Ltd
Manchester, UK

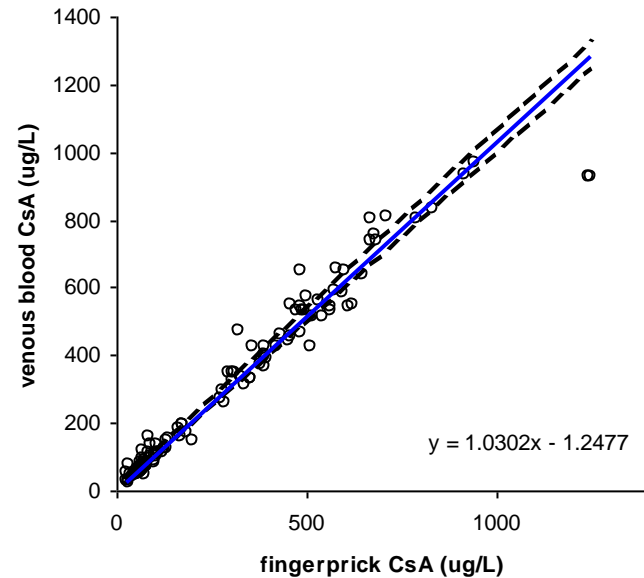
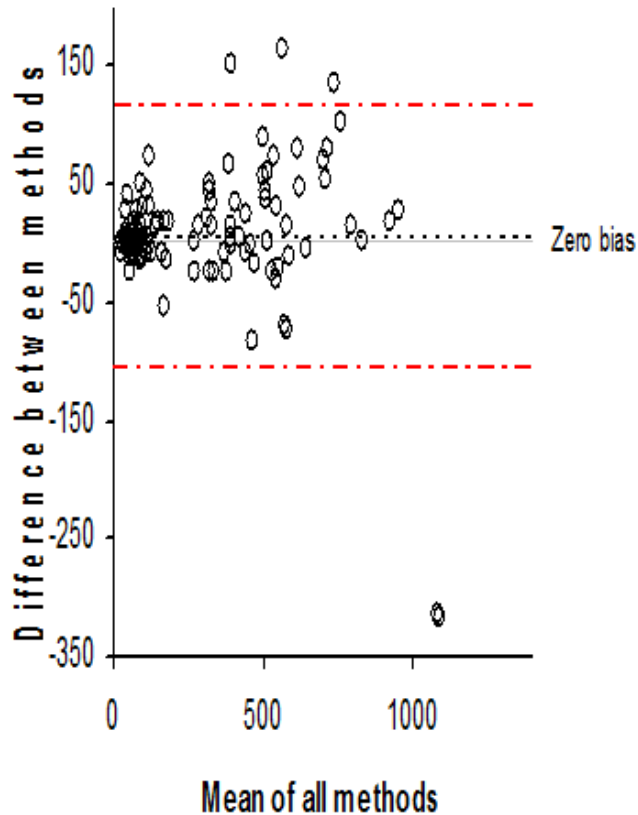
Background The immunosuppressive drug tacrolimus has complex and unpredictable pharmacokinetics, therefore regular monitoring is required in patients receiving tacrolimus therapy. We have developed a liquid chromatography-tandem mass spectrometry (LC-MS/MS) method for measuring tacrolimus concentrations in whole blood and have compared it with a microparticle enzyme immunoassay.

Methods For the LC-MS/MS assay, samples were prepared in a 96-deep well microtitre plate by adding 10 μ L of blood to 40 μ L of 0.1 mol/L zinc sulphate solution. Proteins were precipitated by adding 100 μ L acetonitrile containing ascomycin internal standard. After vigorous mixing and centrifugation, 20 μ L of the supernatant

Venous and fingerprick taken at C0 and C2 65 patients n=130 paired samples adult heart and lung



Venous and fingerprick taken at C0 and C2 60
patients n=120 paired samples
paediatric renal



Adult home monitoring

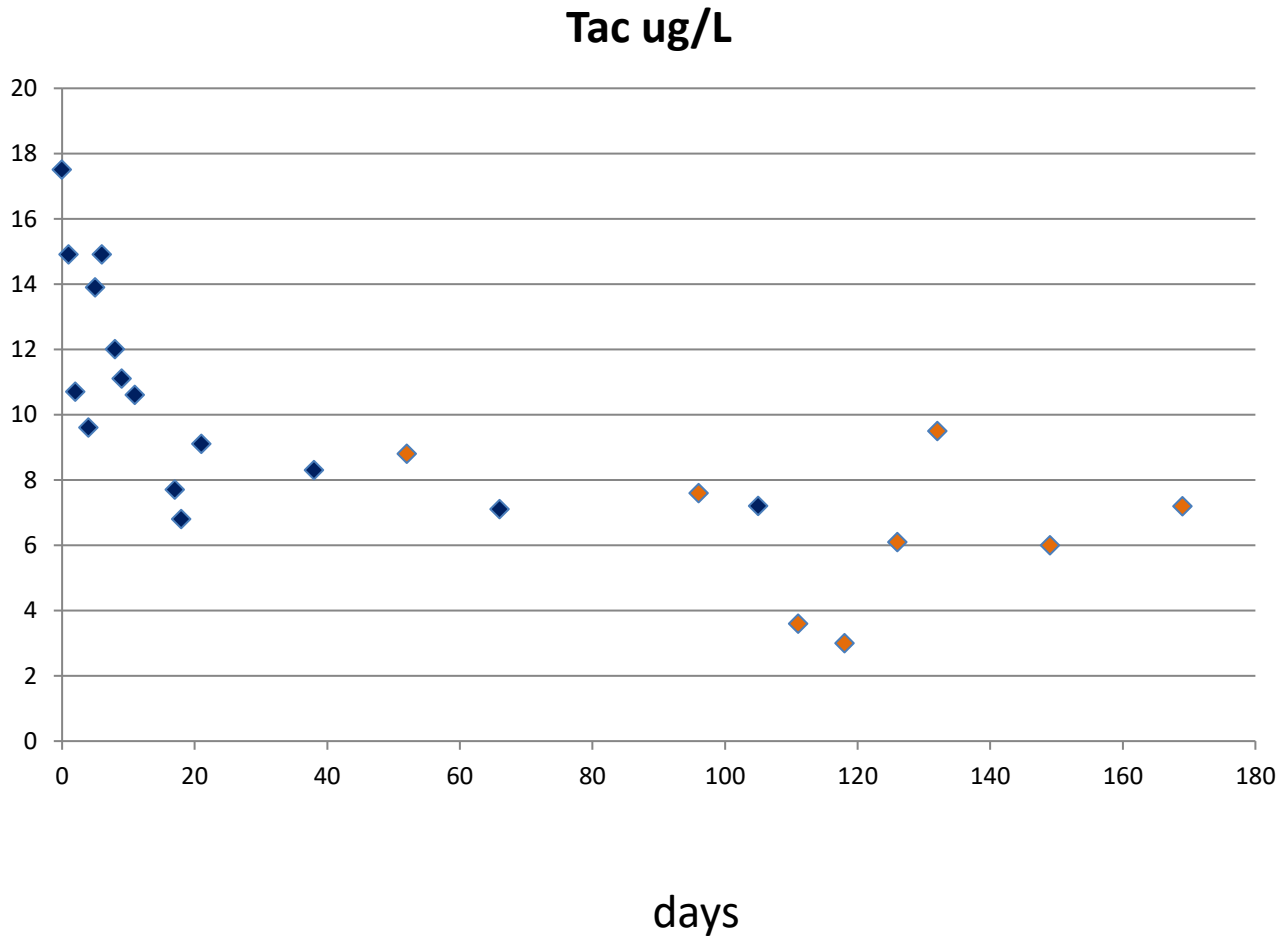
- 52 stable heart Tx patients
- 225 samples
- 14 (6%) unsuitable – clotting 10, insuff 4
- Discomfort not a problem
- Mean postal time 1 day, max 5 days.

Monitoring of cyclosporine levels in transplant recipients using self-administered fingerprick sampling.

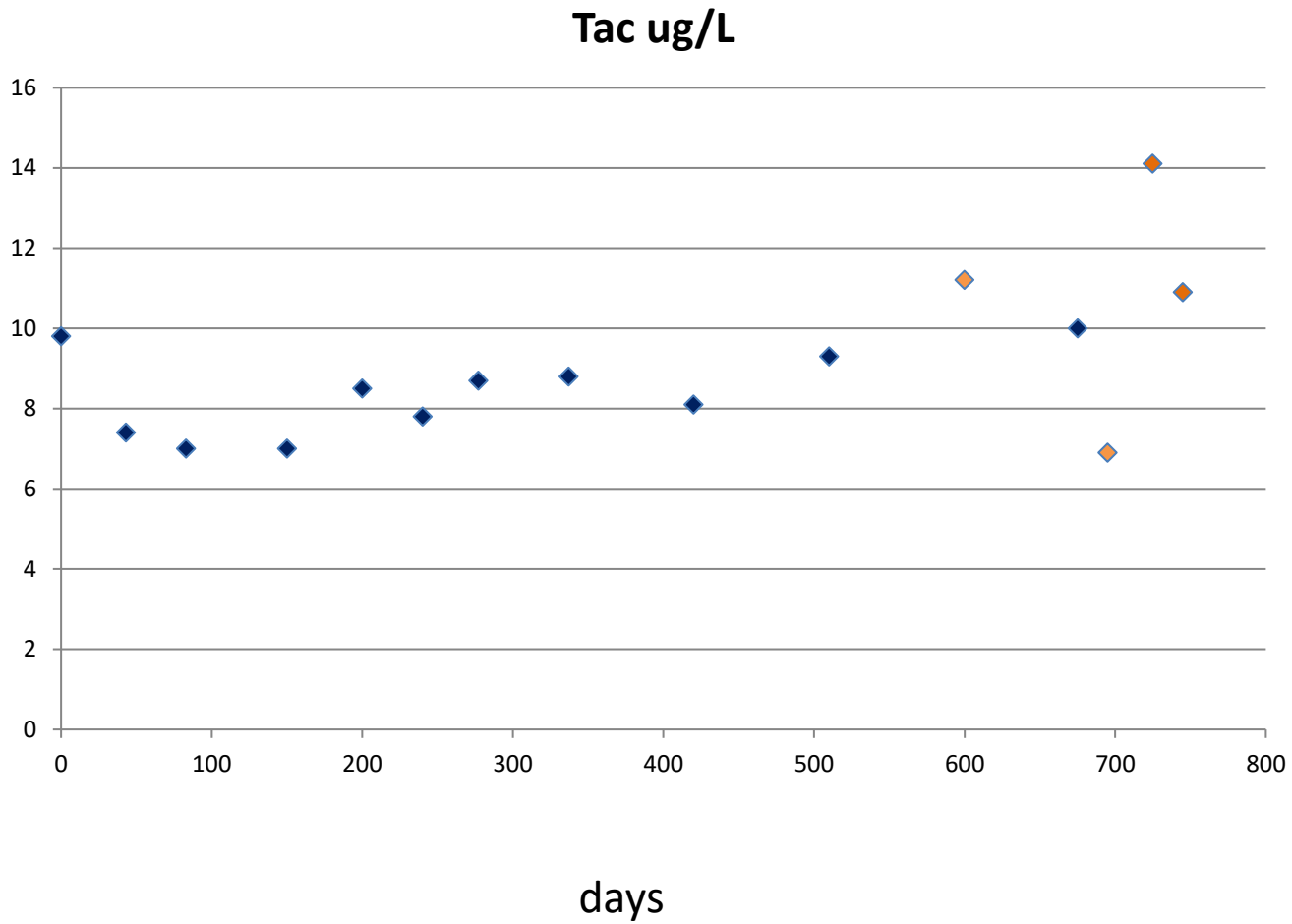
- Dose adjustment on fp result in 20 % of patients
- 10-15 % reduction in clinic visits

**Yonan N, Martyszuk R, Machaal A, Baynes A, Kevil BG
Clin Transplant. 2006;20:221-5**

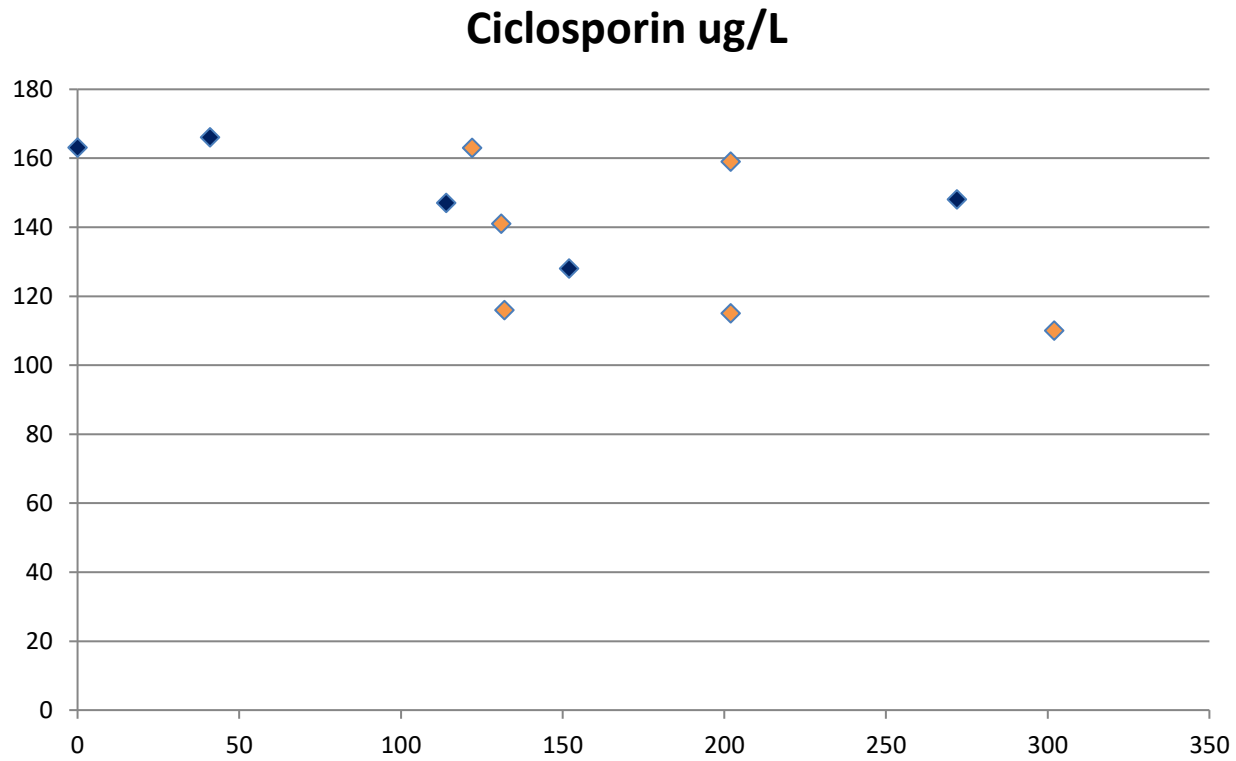
Heart and lung 2018



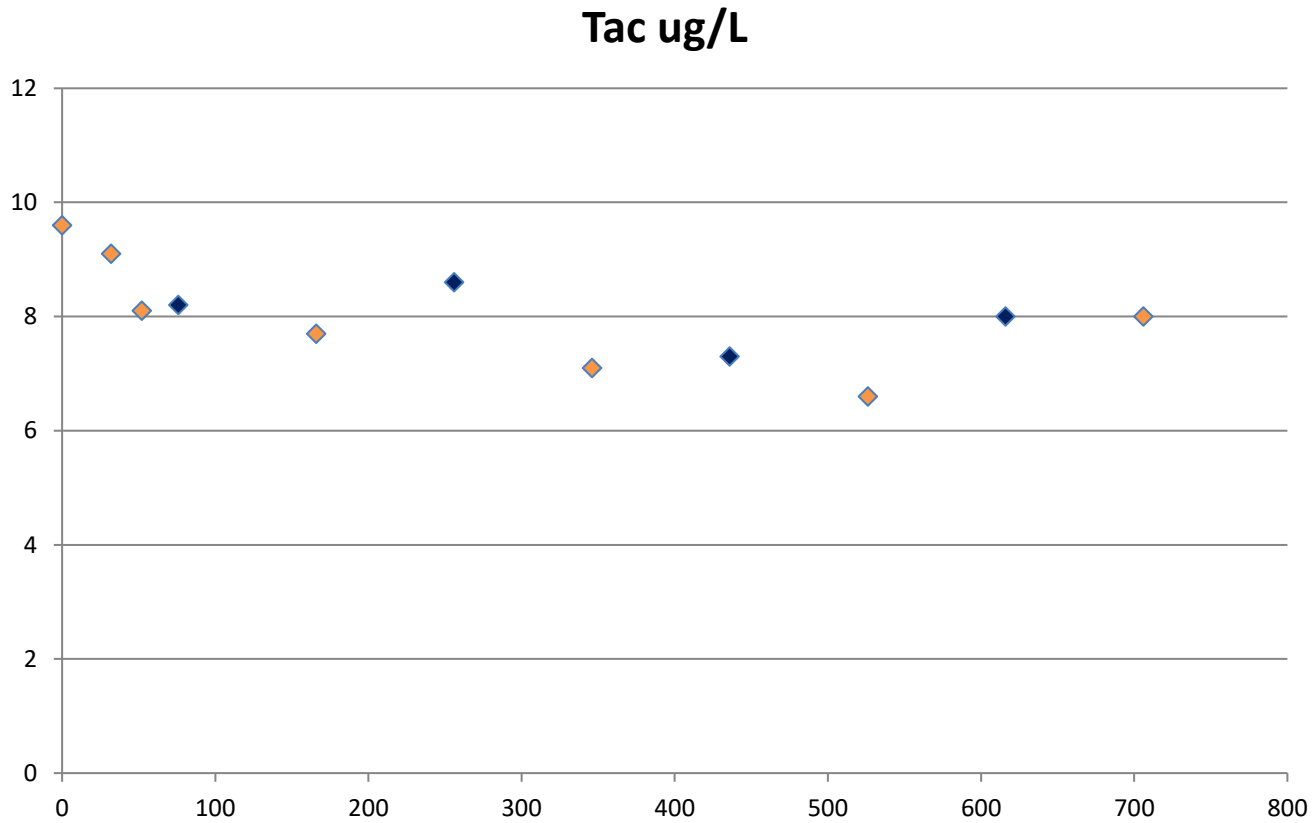
Single lung 2016



Heart Tx 2014

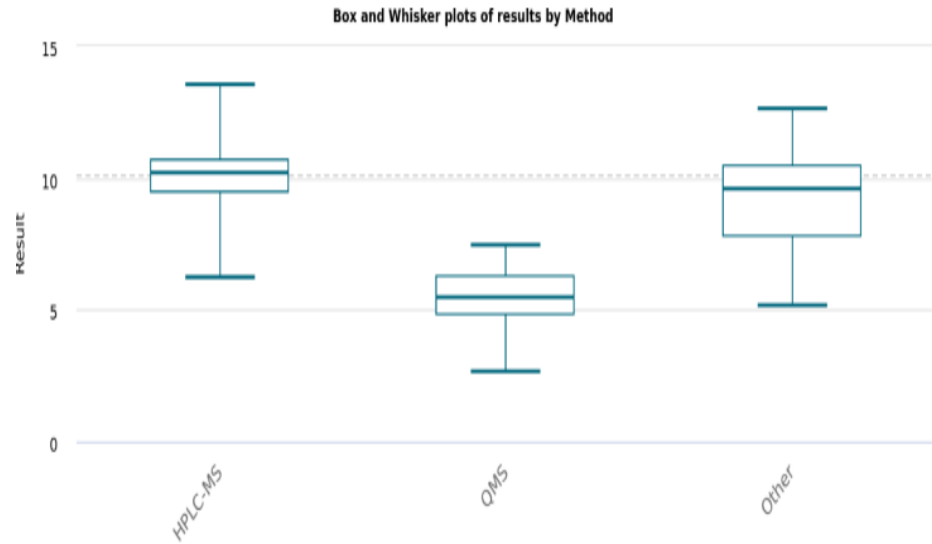
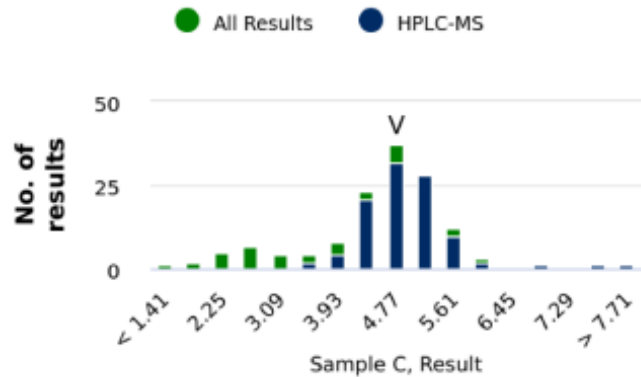
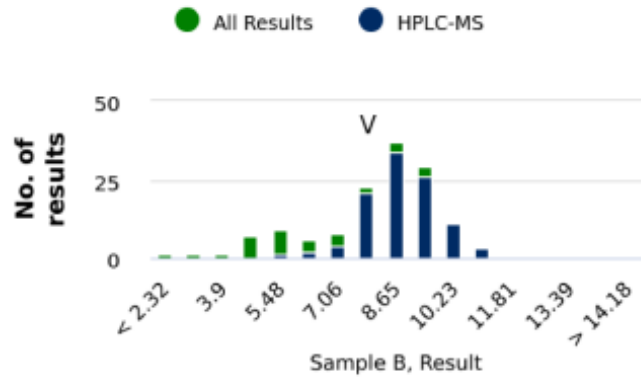
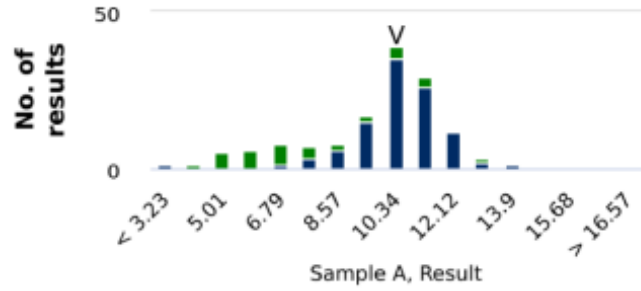


Heart Tx 2012

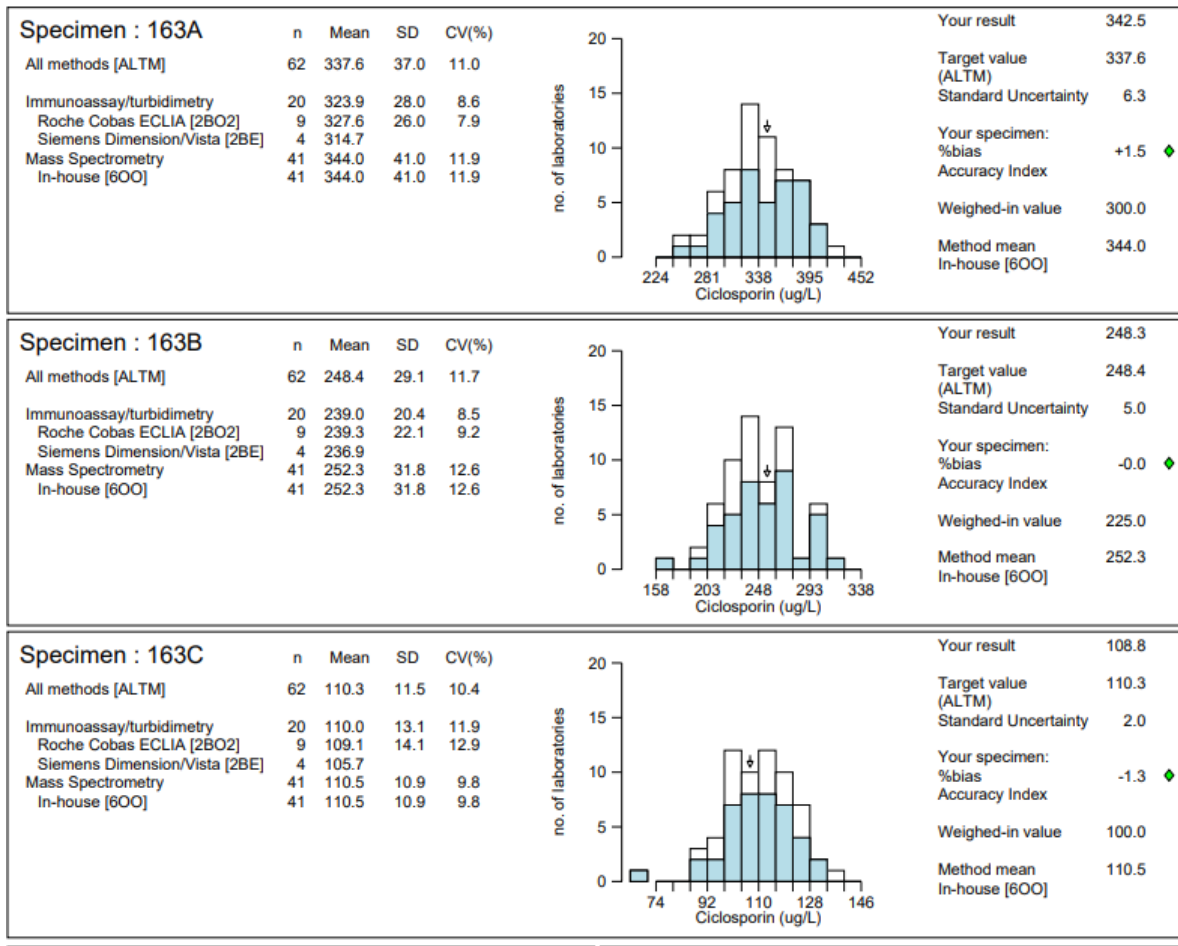


Can we send samples to other labs?

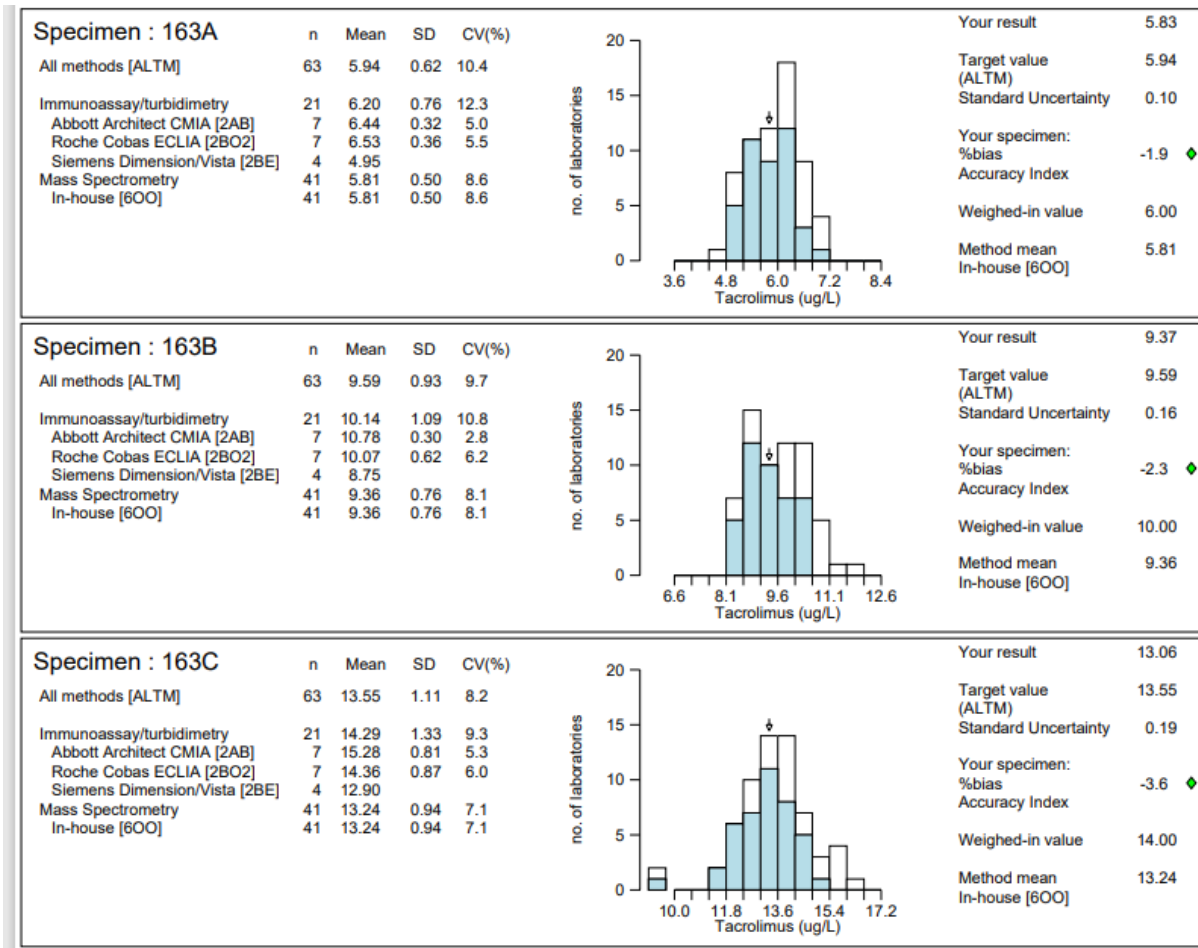
Everolimus



Ciclosporin



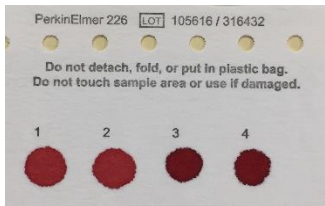
Tacrolimus



Which drugs by fingerprick ?

Dried blood

- Ciclosporin
- Tacrolimus



Lab cost £32

Cost includes creatinine

Wet blood

Lab cost £18
Tube £0.2
lancet £0.1
postage £13.75

Total cost £32

Mitra



Mitra £16.10

- Ciclosporin
- Tacrolimus
- Everolimus
- Sirolimus



Capitainer




Capitainer £8


Postage (UN3373)


Safebox™ leaflet (April 2022)


royalmail.com/sites/royalmail.com/files/2022-04/Safebox-leaflet-April-2022.pdf


Safebox™ step by step


- 

1 Place the sample(s) in a leak proof primary receptacle.
Sample quantity cannot exceed 50ml per consignment
- 

2 Wrap sample(s) in absorbent sheet and place into the grip seal bag and close.
- 

3 Place the filled grip seal bag into the PathoSeal bag.
- 

4 Close the PathoSeal bag following the instructions printed on the bag.
- 

5 Place the completed PathoSeal bag and paperwork into the Safebox.
- 

6 CHECK all contents are included as required before closing.

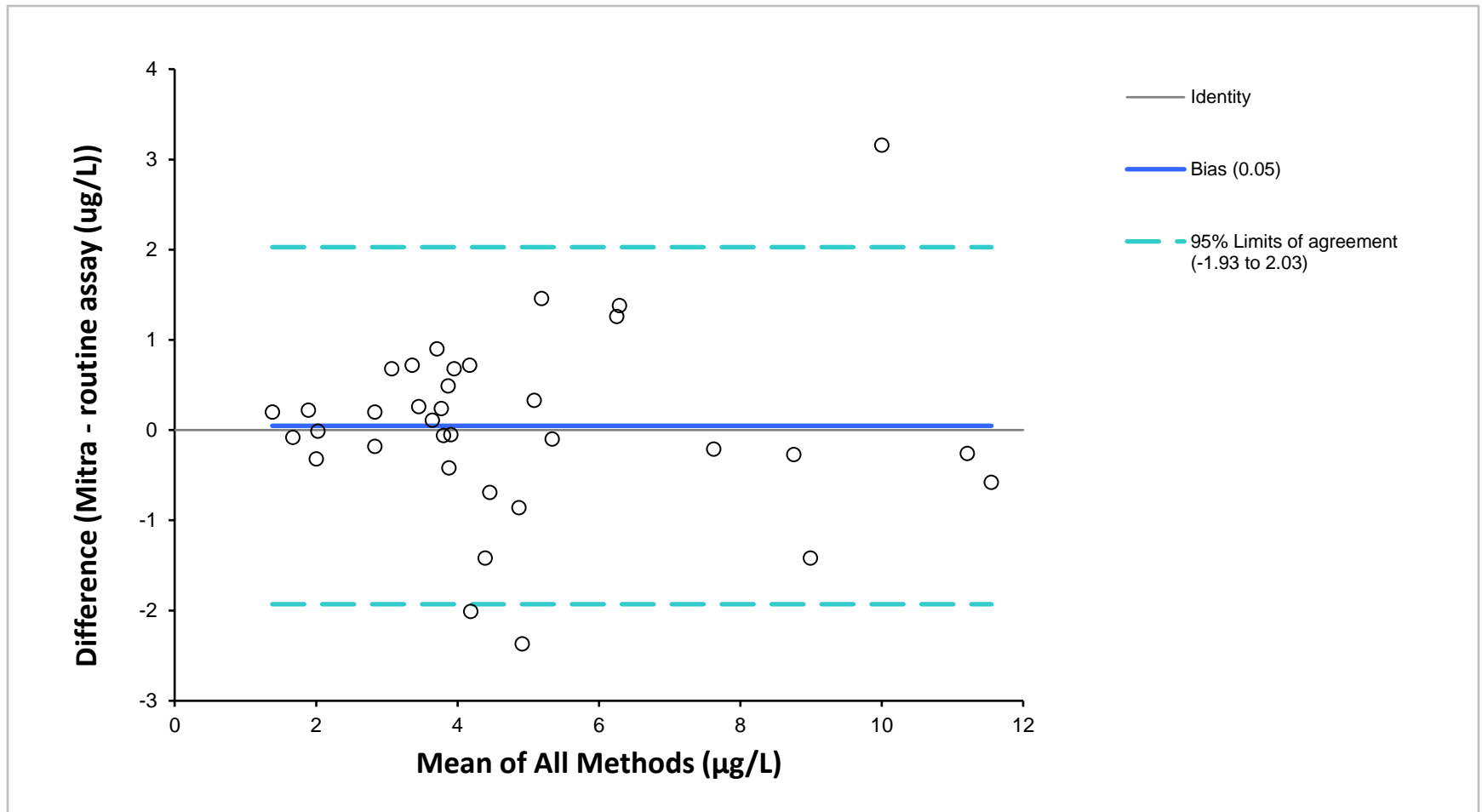
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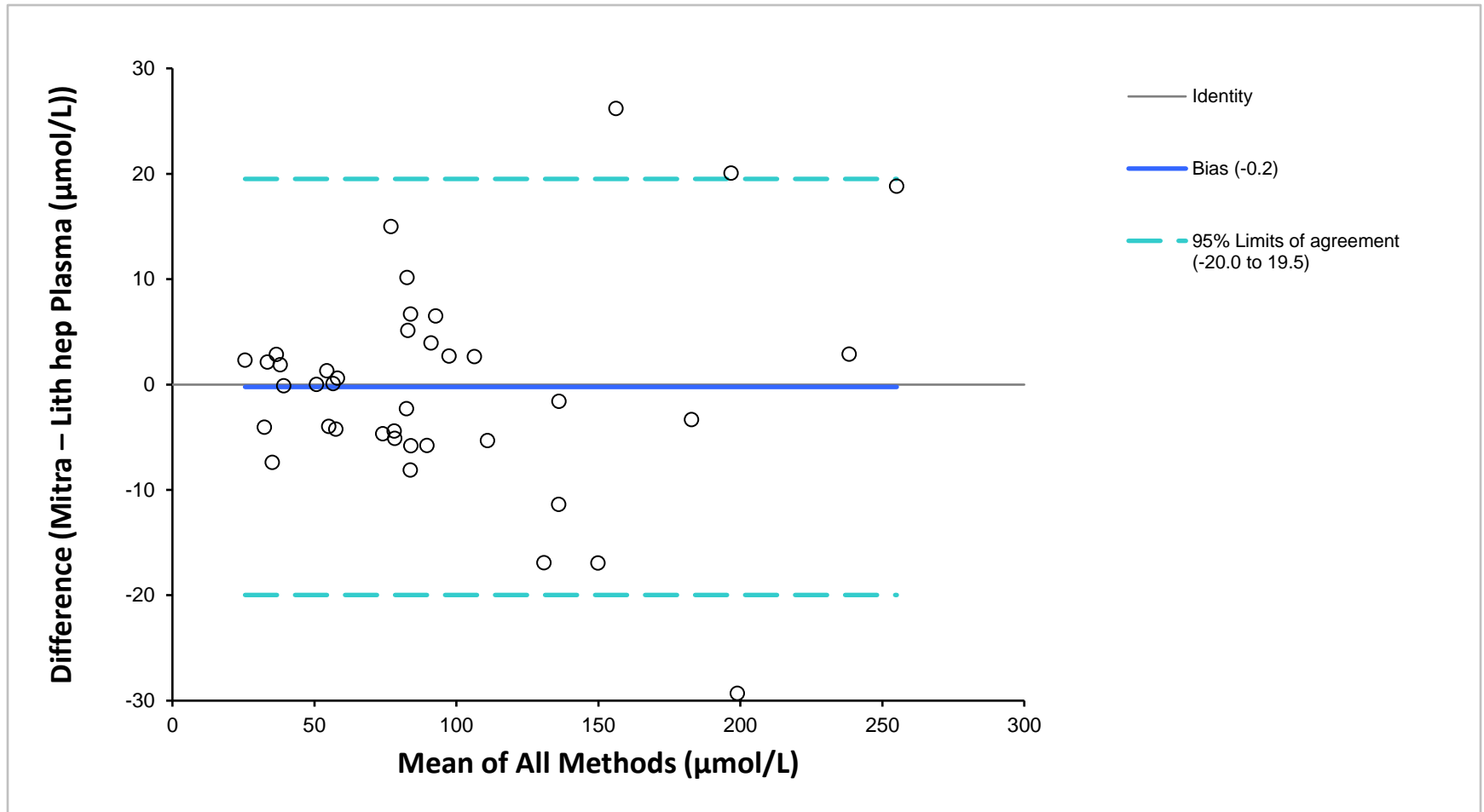
Patient Samples

- Small pilot study with 33 paediatric renal transplant patients on FK506 therapy
- 4 x finger prick Mitra[®] samples collected alongside venous EDTA whole blood & lithium heparin plasma
- Wide range of haematocrit values (11% - 46%)
- Samples posted and analysed at Wythenshawe biochemistry

FK506 (n=35)



Creatinine (n=39)



Seven day stability

- Mitra[®] tips analysed then left on the bench at ambient temperature in a sealed specimen bag
- Re-analysed after 1 week
- Creatinine = $-0.2 \mu\text{mol/L}$ (-0.2%)
- FK506 = $-0.32 \mu\text{g/L}$ (-5.8%)
- Within acceptable limits; able to post

Nottingham Paediatric Nephrology.

Patient response survey

- 83% said test was 'very easy' and remainder 'easy'
- 83% definitely preferred over venous sampling
- 60% said they could perform independently; training required
- Comments were positive;
 - 'It's easier and quicker than coming to the hospital all the time'
 - 'It doesn't hurt and it's quicker'

Do we need special equipment?

- Need LC-MS/MS to handle 10uL of sample.
- Most major H/L transplant centres use LC-MS/MS
- Extra lab cost from handling tips and including creatinine in the method.

Is it Scalable to all centres?

- Potentially yes.
- Some patients may not be happy doing it.
- More work for the laboratory.
- IT problems especially between centres.

Acknowledgements

- Transplant team at Wythenshawe
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