Growth Factor-1 (IGF-1) is secreted. IGF-1 promotes cell proliferation, causing abnormal bone muscle growth and apoptosis inhibition and the resulting in acromegaly. Transsphenoidal surgery is the recommended primary therapy with biomarker post-operatively to measure any recurrence. GH secretion is pulsatile and varies widely over 24h whereas IGF-1 secretion is more continuous and so is a more stable biomarker in diagnosis and postoperative monitoring of the disease. IGF-1 is usually measured in serum or plasma by mass spectrometry or immunoassay. Immunoassay is simpler and faster but it is important to use an antibody with a high degree of specificity.

**Materials and Methods**

Comparison of IGF-1 concentration in plasma and whole blood extracted with 10 µL Mitra tips

20 whole blood (EDTA) samples of IGF-1 concentration ranging from 50.9 to 515.4 ng/mL, were measured to compare the IGF1 results of the plasma and the whole blood using VAMS. IAMS was used to sample the whole blood and then was air dried at room temperature for 2 hours. VAMS was placed into a microcontainer filled with 150 µl of distilled water and rotated on a rotating chamber for 1 hour. IGF-1 was measured using IDS-iSYS immunoassay analyser. The original whole blood was centrifuged and the plasma was measured directly on the analyser to compare the result with VAMS extracted whole blood.

Comparison of IGF-1 concentration of serum and whole blood extracted with 10 µL Mitra tips

10 paired whole blood (EDTA) and serum samples of IGF-1 concentration ranging from 96.9 to 515.4 ng/mL, were measured to compare the IGF1 results of the whole blood samples using VAMS. Mitra tips were used to sample the whole blood and air dried in room temperature for 2 hours. Mitra tips were pooled into microcontainer filled with 150 µl of distilled water and rotated on the rotating chamber for 1 hour. IGF-1 was measured using IDS-iSYS immunossay analyser.

Stability experiment

16 VAMS sampled mid-level of IGF-1 of both serum and plasma of the same patient (serum IGF-1 of 150 ng/mL). Another 16 VAMS sampled high level of IGF-1 of both serum and plasma of the same patient (serum IGF-1 of 577.5 ng/mL). The samples were dried in room temperature and extracted after 2, 24, 48 and 96 hr. The samples that were extracted earlier were stored in -20°C freezer. IGF-1 level of all the samples were measured together in a single analytical run using IDS-iSYS immunoassay analyser.

**Results and Discussion**

Results from both the serum and plasma experiments demonstrated that IGF-1 was detected from reconstituted blood from the Mitra tips. The Mitra tips correlated very well when compared with both the plasma (R² = 0.952) and serum (R² = 0.983) results. The correlation coefficient to the fact that only 20 µL blood was taken per Mitra experiment allowed to dry and reconstituted in 150 µl, a dilution factor of 7.5 was applied to the data (Figures 3 and 4). Moreover, the data for both the serum and the blood showed a positive bias for serum (y = 0.7332) and plasma (y = 0.7632). There are two possible reasons for this. The first is it is likely that IGF-1 is not present in whole blood cells so it would be expected to see less IGF-1 in the same volume of blood when compared to serum or plasma. Indeed this is exactly what has been seen for Vitamin D extraction on Mitra. Due to the fact that the Mitra extraction samples were 7.5 x diluted very low levels of IGF-1 were not detected whereas the plasma concentration was below 85 ng/mL. This could be improved if more Mitra samplers were used in each extraction.

The stability experiment was very encouraging showing no significant loss (Figure 5) of IGF-1 even after 4 days dried at room temperature for both M and low (K).

**Conclusions**

The results shown in this investigation give very encouraging results that Mitra can be used for analysis of biomarkers on immunossay instruments. Moreover, for IGF-1, dried-blood extracts form Mitra correlated very well with both wet plasma and serum samples. However, new reference ranges would be needed to be created due to the volumetric presence of the haematocrit. Furthermore, it was noted that the very low level concentrations of IGF-1 were too distant from Mitra (normal reference range for a male is 75–275 ng/mL) and so efforts would be needed to reduce the amount of dilution or modifications would be needed to be done to the instrument to boost sensitivity. Nevertheless, the results show that as a convenient at-home monitoring option, Mitra microsampling devices show great promise.