Next generation, fast and accurate point-of-care test for NT-proBNP based on Magnotech technology

Hefti MH¹, Raymond F², Immink AHJ³, Benoit V², Nieuwenhuis JH³, de Theije FK³, Inçaurgarat B²
¹Future Diagnostics BV, The Netherlands; ²bioMérieux SA, France; ³Philips Healthcare Incubator, The Netherlands
hefti.m@future-diagnostics.nl

Introduction

In the emergency care setting, where time is of essence, there is a need for fast and reliable information on NT-proBNP levels for diagnosis and management of acute dyspnea [1]. Rapid NT-proBNP testing near the patient has the potential to streamline the process of care, but only if it is robust, fast and accurate enough to operate safely at the point-of-care.

Here we report on the development of a novel NT-proBNP point-of-care (POC) test which can be entirely carried out in a handheld device. This test has the potential to be rapid (less than 8 min), easy to use, and with good accuracy compared to state-of-the-art automated lab assays currently on the market.

Materials and Methods

This new NT-proBNP POC test under development is based on Magnotech technology. Magnetics is the driving force behind each Magnotech immunoassay, allowing fast binding kinetics and good precision [2]. The one-step sandwich immunoassay is performed in a compact plastic disposable cartridge with on-board dry reagents and magnetic nanoparticles. After a short incubation step the amount of bound nanoparticles, proportional to the concentration of NT-proBNP in the sample, is detected optically [3].

A unique feature of the system is its high precision over a wide measuring range. This is of particular benefit in an NT-proBNP assay, where highly quantitative detection of the marker is required at a number of clinical cut-off values spanning several orders of magnitude.

The precision of the assay at its current state of development was determined for plasma samples with NT-proBNP levels at clinically relevant values of 125 ng/L and 411 ng/L (10 replicates). Assay accuracy was determined by measuring 104 patient samples (lithium heparin plasma, NT-proBNP levels from 20 to 5000 ng/L) on both the Magnotech-based device and the bioMérieux VIDAS lab system, and comparing results by Passing and Bablok regression analysis.

Results and Discussion

To be a viable alternative for central lab automated system analysers, for POC applications the assay sensitivity is important. Our Magnotech NT-proBNP assay at its current state of development has an analytical sensitivity in the same range (currently around 10 ng/L) as for example the bioMérieux VIDAS NT-proBNP assay ref 30449 (20 ng/L).

Assay precision was characterized by CV levels of less than 10%. NT-proBNP results correlated well with VIDAS (r=0.89), with a corresponding slope of the regression line of 1.12 (95% CI 1.01 to 1.22) and an intercept of 64.04 (95% CI -73.50 to 109.83).

In the current format under development, the Magnotech NT-proBNP assay time with plasma samples is only 5 minutes. We are in the process of adding a filter that will allow measurements from whole blood directly. Flow experiments show that the filling time of the cartridge with whole blood is less than 30 seconds, resulting in a total assay time of less than 6 minutes, and a time-to-result of less than 8 minutes.

Conclusions and Outlook

The Magnotech-based NT-proBNP assay shows promising performance for rapid, reliable NT-proBNP testing at the point of care in emergency settings. Development work is presently focused on the integration of a blood filter into the cartridge, to allow tests to be performed from a drop of blood.

References


Works in progress. Not available for sale