INTRODUCTION

Test systems using whole blood and requiring no pipetting or diluting steps are less accurate than systems which require specimen manipulation steps. This paper reports on near-patient, portable, clinical chemistry system that provides the clinician with rapid availability of in vitro diagnostic results. The Piccolo system reports results for panels of blood tests within 1 minute of sample collection.

The Piccolo® Xpress™ is a multiple analyte whole blood analyzer that provides easy-to-use, highly portable testing for nine wave-lengths, calculates the results from the absorbance data, and reports the results on a convenient sticky-backed thermal roll-tape printer.

The analyzer detects the presence of each cuvette by sensing the 45 degree wedges of plastic placed every 12 degrees around the periphery of the disc. On each spin, the processor selects which cuvettes to fill. A MULTIPLE ANALYTE WHOLE BLOOD ANALYZER

Each cuvette has a single channel for both flow of fluid into the cuvette and air venting. Under highly controlled conditions, the fluid flows over one side of the first channel until air vents from the pressure head of the remaining fluid. The disc must also spin fast enough to overcome the capillary resistance of the inlet channel for the fluid to be metered. Each cuvette contains one or two beads of lyophilized reagents appropriate for the particular test to be run within that cuvette; these beads dissolve completely in the time required to fill the cuvette.

The disc is spun at 3000 rpm clockwise for 40 seconds. The diluted plasma flows out of the mixing chamber and into a distribution channel which leads to 21 cuvettes and an isolation dump. The 21 cuvettes are filled sequentially and the remaining diluted plasma flows into the dump.

The final siphon is primed by capillary action after mixing is complete and the disc is stopped. The disc is then spun at 1000 rpm counterclockwise for 70 seconds. This oscillation cycle isolated in the dump, the disc is oscillated from 1000 rpm clockwise for 3.5 minutes by flashing the xenon arc lamp synchronously with the spinning disc. The lamp is flashed approximately 2500 times for each disc.

The analyzer detects the presence of each cuvette by sensing 45 degree wedges of plastic placed every 12 degrees around the perimeter of the disc. On each spin, the processor selects which cuvettes to fill and sets the pin wavelengths to measure the absorbance of each cuvette. At the end of this oscillation cycle, the disc is spun at 3000 rpm clockwise for 40 seconds. The diluted plasma forms swirl patterns in the cuvettes which mix the chemistry and the plasma. After all of the cuvettes are filled, and the excess diluted plasma is isolated in the dump, the disc is oscillated from 1000 rpm clockwise to 1000 rpm counterclockwise for 10 seconds. This oscillation cycle removes any metering errors that may have occurred during the metering sequence. The disc is then stopped and the remaining diluted plasma flows into the dump.

The results are printed on an adhesive-backed card for easy attachment to the patient’s medical record. In addition, the results can be uploaded to a computer roll-tape printer.
O

lyophilized reagent beads for each chemistry in the panel are

with diluent. The cuvettes have five pathlengths (1.7 mm, 2.1

filled with diluted plasma and four cuvettes that will be filled

when stored at 8°C. The disc contains 21 cuvettes that will be

diluent. Fluid loss from the container is less than 5 μl per year

and provides imprinted bar-coded, disc specific calibration

the cuvette windows from fingerprints, prevents contamination

middle layers form the cuvettes, chambers and passageways

layer are molded from polymethylmethacrylate plastic and the

welded together to form the reagent disc. The base and middle

be loned from polyethylene-laminated aluminum foil. A tab on the foil is

molded high-density polyethylene plastic container, is sealed

the disc is loaded onto the spindle. The diluent container, a

Transparent to the user, the diluent container is opened as

in the 'sufficient sample' cuvette, the analysis is aborted due

sample is trapped in an isolation dump. If no fluid is detected

overflows into a 'sufficient sample' cuvette. Any excess

small channel into the plasma metering chamber. The chamber

the sample to exit the application chamber and move through a

part of the Intelligent Quality Control (IQC) process.

isolated from the rest of the disc. The four cuvettes are used as

part of the Intelligent Quality Control (IQC) process.

transiently. Any sample that is not collected is discarded.

the disc. The operator places the disc with applied sample

A minimum of 90 μl is required and up to 120 μl may be applied

siphon entrance is located partway down the plasma metering

outermost point of the diluent metering chamber. Another

samples up to a hematocrit of 62%.

Spinning the disc for 2.5 minutes is sufficient to separate

packing times to provide the necessary 20 μl of clear plasma.

Samples with higher hematocrits require longer separation and

to a deficient quantity sample. The precise quantity of blood

in the 'sufficient sample' cuvette, the analysis is aborted due to

of sample and red blood cells is trapped in the lower portion of

volume of plasma metered is 18.75 μl. The remaining 56.25 μl

the placement of the exit of the plasma metering siphon. The

extreme edge of the diluent metering chamber. The plasma

The disc abruptly brakes to a

speed of 750 rpm and then slowly climbs back to 4000 rpm,

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