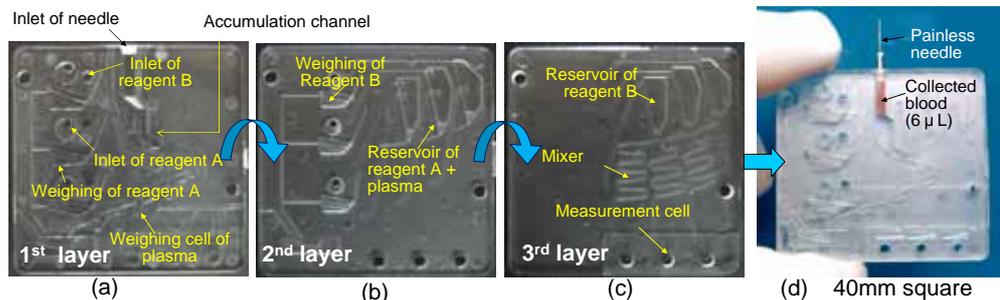


Clinical Device for Home Medical Diagnostics Using a Painless Needle

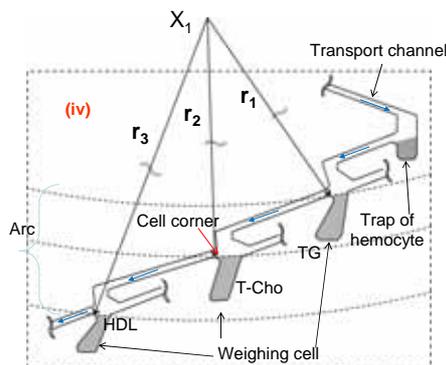
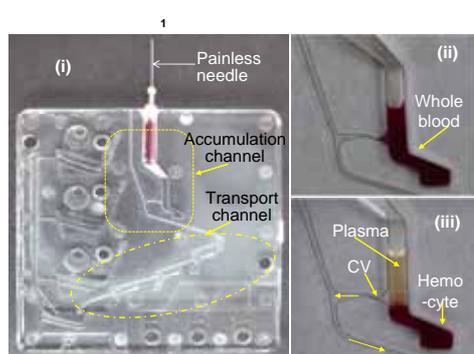
Dr. Yasuhiro HORIIKE (National Institute for Materials Science)

1. Chip(d) made by stacking three layers(a-c)



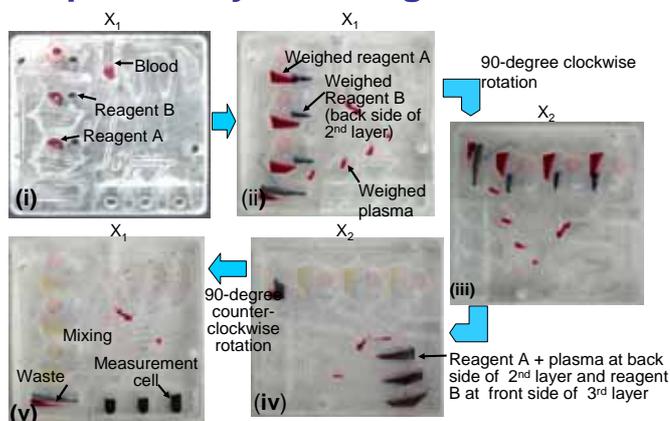
The chip functions; (1) measurement of triglycerides (TG), total cholesterol (T-Cho), and high-density lipoprotein (HDL) from 6 μL of whole blood collected manually by painless needle, (2) operated only by centrifugal force, (3) a channel design to simultaneously separate hemocyte (blood cells) and plasma and accurately weigh the plasma for each component and (4) a mixing channel structure to achieve high mixing ratios of reagents with tiny amounts of plasma.

2. Centrifugal separation of whole blood and weighing of plasma



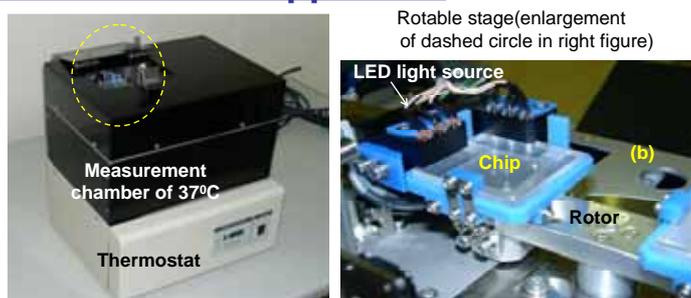
- (i) The painless needle is inserted into the accumulation channel of the chip (dotted lines).
- (ii) Centrifugal force generated by revolution centered above X_1 conveys the blood to the accumulation tube.
- (iii) Continued revolution separates plasma and hemocyte.
- (iv) Plasma conveyed through a CV (Capillary valve, see (iii)) and transport channel is weighed into TG (right), T-Cho (middle), and HDL (left) cells. Lengths of radii follow order of $r_1, < r_2 < r_3$ from X_1 to the three cells.

3. Weighing and transport of reagents and plasma by centrifugal force



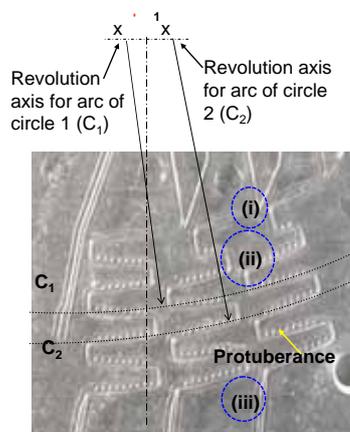
- (i) Injection of reagents A and. (ii) Weighing of reagent A/plasma and reagent B at back of 2nd layer. (iii) $C90^\circ$ clockwise. (iv) Transport of A /plasma B to each reservoirs . Rotated 90° counterclockwise, (v) Mixing of A/plasma and B in mixing channels and measurement.

5. Examination apparatus

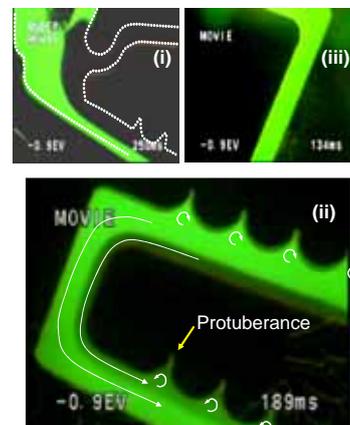


The apparatus operates. A pulse motor turns the stage housing the chips. The measurement cells including samples after reactions are illuminated by LEDs with a central emission peak of 600 nm, which is suitable for the three analytes. The colorimetric measurements are carried out by endpoint assay, which quantifies a component by measurement of the absorbance at the end of reaction.

4. Mixing in zigzag channel



Dotted circles of (i), (ii) and (iii) correspond to mixing observation of right hand figures. The upper walls of the channel have protuberances. The zigzag channel allows the alternate movement of the solutions, promoting mixing.



Stills are taken from a movie. (i) of Introduction of equal amounts of PBS with (green) and without (black) fluorescence. (ii) Zigzag channels. (iii) Exist from channel. Complete mixing is achieved.

6. Patent status & Patent owner contact

■ Patent license is available.

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Apply country : JP,US,EP,KR,CN

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