Electronic Supplementary Material (ESI) for Lab on a Chip
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Supplementary Information

1. Punched cards and their principle of operation.

Fig. 1: Individual punched cards (a) are strung together into a series of several hundred punch cards and fitted into the Jacquard (b). The yellow hanging threads in (c) correspond to a set of hooks that can either be raised or stopped depending on the presence or absence of a punched hole in the card. The hook serves to raise or lower a harness that in turn raises or lowers a set of warp threads. Any number of warp threads may be simultaneously raised or lowered so that the pattern can be repeated across the fabric (d).

To cite the Computer history museum , (http://www.computerhistory.org/revolution/punched-cards/2/4)

“As one of the earliest examples of automatic control, Jacquard’s looms were controlled by a set of punched cards bound together into a ‘program.’ The pattern of holes made in these cards determined the weaving pattern made by the loom and highly-elaborate designs were possible. Each row on a card corresponds to one row of the textile design, and each hole

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controls whether a crosswise (weft) thread goes above or below the lengthwise (warp) threads." The sequence of raised and lowered threads is what creates the pattern. "The Jacquard cards are strung together with narrow ribbons, so they are more like computer paper tape than separate punched cards. The loom, manually operated but card-controlled, allowed even unskilled workers to create complex patterns. Similar looms are still used today, mostly in developing countries, although modern looms are controlled by computers. "A complex pattern woven by the loom needs tens of thousands of individually punched cards. But once made and debugged – like a software program -- the cards can be used many times to create identical fabric. The cards can also be used to make identical repeats of the pattern across the same fabric. The ability to change the pattern of the loom's weave by changing the cards was an important conceptual precursor to the development of computer programming.

2. Flow Paths and their Application

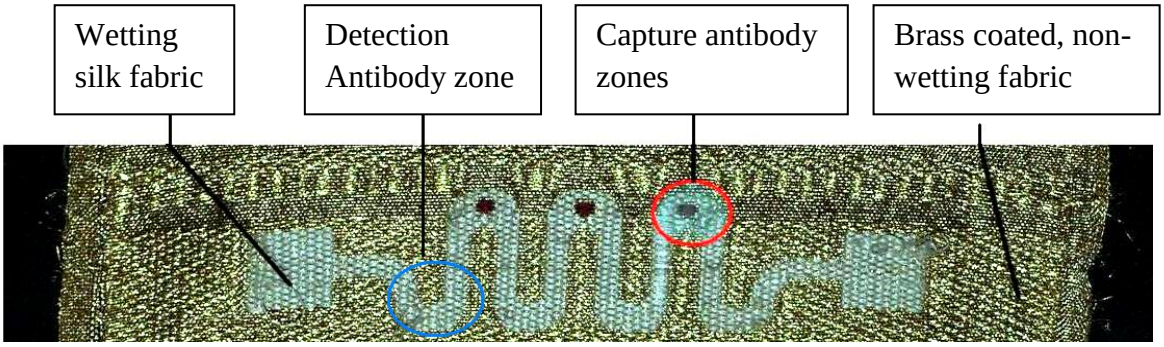

Fig. 2: A schematic of the application of flow paths to perform immunoassays.

The figure shown here is a patterned flow path for a 3-plexed test. The serpentine flow path can be used to provide appropriate incubation times while different reagents can be woven into different locations as shown.

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3. Demonstration of a proof-of-concept Sandwich Immunoassay

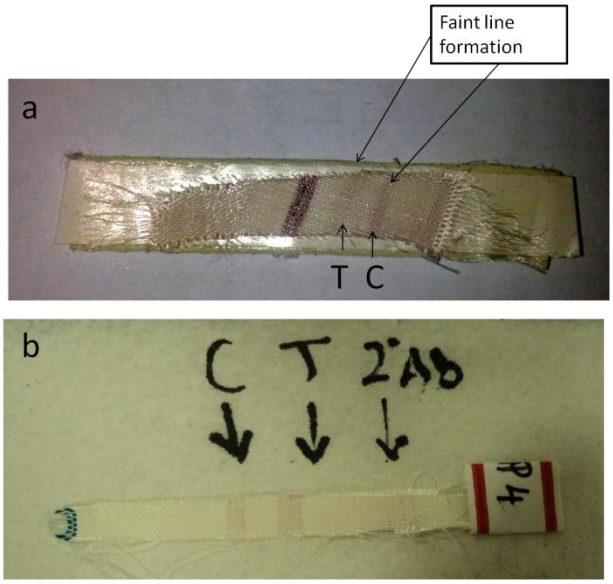

Fig. 3: The composite figures shows the formation of faint lines. These chips need to be further optimized before they can be used for a visual readout. A)Sandwich immunoassay using 100 ng/ml of Prolactin solution in serum as the sample. Note that detection antibody leaching was improper leading to the faint lines. B)Direct immunoassay on the GAR system described in the paper. Here the amount of Rabbit IgG was 100 ng (Test line) and the amount of Anti-Goat IgG was 100 ng (Control Line).