A novel solution for diagnostic printing

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Background

Inkjet printing is a promising method for delivering biological molecules onto solid surfaces. Recently a new construct has been developed and used to modify the biosurfaces of cells and viruses. As these constructs, known as FSLs (function-spacer-lipid) are dispersible in water, it makes them ideal candidates for use as bio-ink. The FSL constructs are analogous in structure to a flower and consist of three components: a Functional head group, a Spacer and a Dialcyl Lipid. Current FSL functional groups include carbohydrates, peptides, and cell labels (fluorophores, biotin, tyrosine\textsuperscript{[1]}), and the repertoire is continuously being expanded. The lipid tail anchors the FSL construct to the membrane while the spacer is designed to allow both dispersion in biological compatible solutions and spacing away from the membrane. If the functional group is not in the form of an FSL construct, it does not attach to membranes/surfaces. The FSL construct per se is biologically inert, and the only biological activity observed is that introduced by the F group.

Materials & Methods

\textbf{Printer}: Epson Stylus 1212 piezoelectric printer (Fig 1).
\textbf{Printing solution}: FSL 1mg/ml in PBS with 0.05% bromophenol blue as a visualisation-dye loaded into a volume-reduced standard refillable inkjet cartridge. A variety of different FSLs have been successfully printed. Representative results are shown for FSL-A(GALN)x3[Fz2]/[FALb]S:AI4-1.

Conclusions

By simply replacing the ink in a desktop printer with FSL constructs, novel informative diagnostic systems can be created. The FSL constructs when printed are colourless, and only appear as words or images if they react with a diagnostic marker (following development). The flexibility of the system allows informative words (in any language), images, barcodes, etc., to be printed allowing for machine and human readable results. As this technology uses stable reagents and works at room temperature, it is very suitable for third-world and field diagnostic applications. The recent development of FSLs for infectious disease now has the potential to extend printing into low cost infectious disease assays.

Fig 5. Original result used to create the title banner

Bibliography

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