Rapid Screening Test on DVD-R for Water Priority Pollutants

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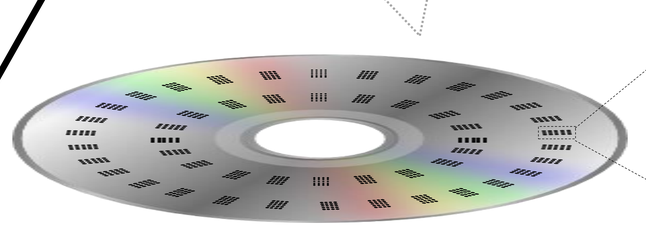
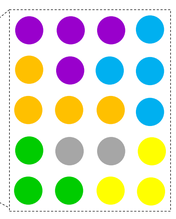
1. Introduction

Rapid screening tests of a large number of analytes are of great interest in modern analysis. Lateral flow test strip (e.g. pregnancy test) is a widely used rapid and non labour-intensive technique but it gives only qualitative results. We present one-step immunoassay, on a standard DVD, where nanogold bioconjugates directly detect small organic water pollutants. Results can be seen by the naked eye without any amplification step and quantifed by a comercially available DVD reader.

2. DVD layout

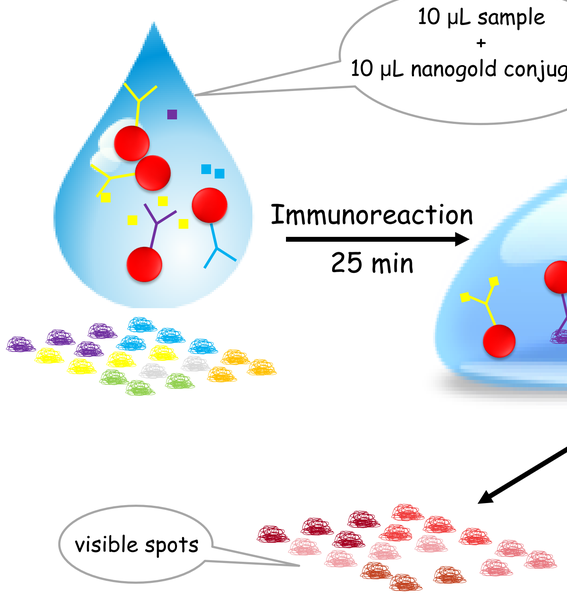
Standard DVD
50 arrays = 50 samples





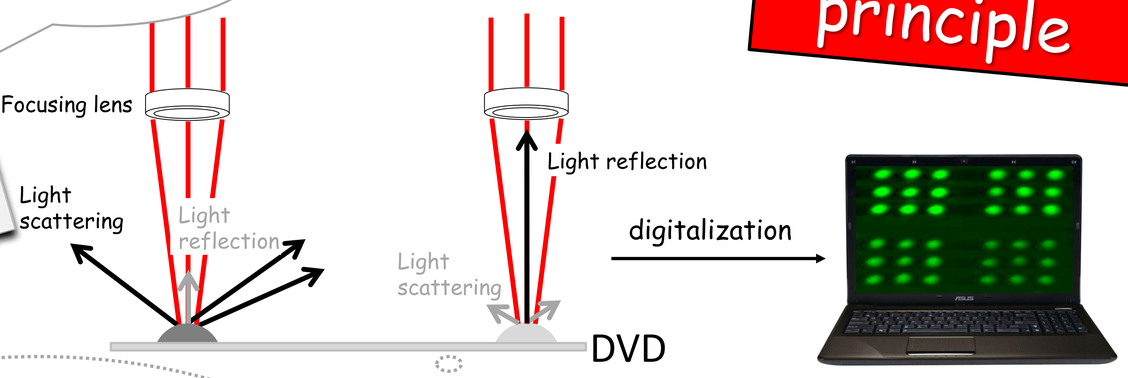
- alachlor
- atrazine
- chlorpyrifos
- + control 1
- + control 2
- - control

3. Immunoassay steps

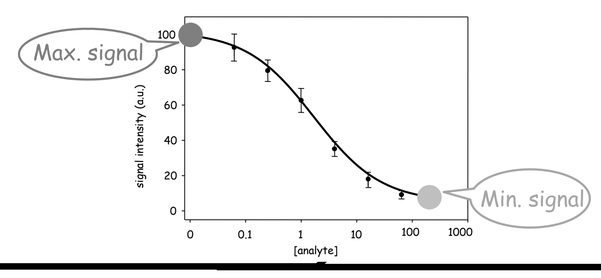


Comercial DVD player as a portable detector

4. Detection principle

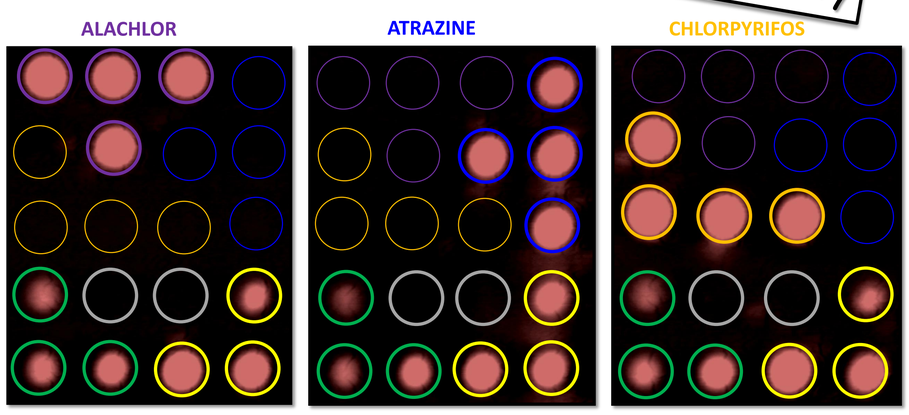


During the DVD reading, the laser strikes the immunoreaction product which modifies the reflection properties of the DVD surface, attenuating the laser beam intensity that reaches the photodiode of the pickup. The analog signals are directly acquired from the photodiode of the DVD drive, being related to optical density of the reaction product which is inversely proportional to analyte concentration.



5. Results

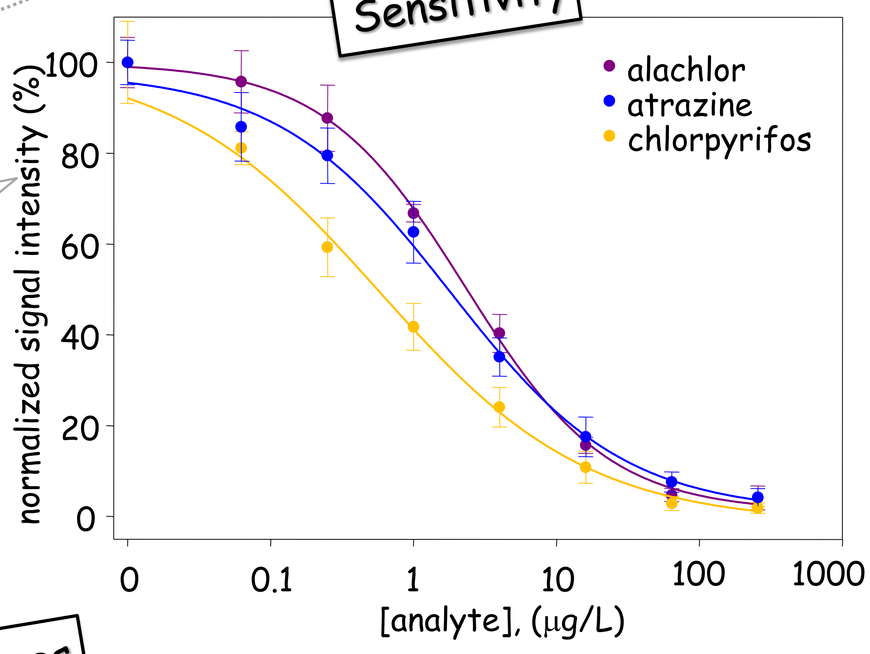
Selectivity



Full selectivity:
Each antibody recognizes specifically only its own coating conjugate

Sensitivity

Calibration curves of one-step triplex immunoassay



Analytical features

Analyte	LOD (µg/mL)	IC_{50} (µg/mL)	DR (µg/mL)	r^2
Alachlor	0.20	2.31 ± 0.16	0.29 – 20.23	0.999
Atrazine	0.24	2.58 ± 0.12	0.25 – 9.15	0.999
Chlorpyrifos	0.11	1.82 ± 0.34	0.20-17.27	0.998

LOD- Limit of detection
IC_{50} – sensitivity
DR – dynamic range
r^2 – linear regression coefficient

6. Conclusions

- Low sample volume required (10 µL)
- Results in one step within 25 min.
- High-throughput (50 samples analyzed simultaneously)
- Nanogold bioconjugates are selective and sensitive immunoreagents
- Rapid, user-friendly and cost-effective method
- Serves as a tool for *in situ* multiplex screening

7. References

Water Priority Pollutants Directive 2008/105/EC

S. Morais, J. Tamarit-Lopez, R. Puchades, A. Maquieira, Environ. Sci. Technol. 44 (2010) 9024

8. Acknowledgements

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9. Notes

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