
Advanced Technologies for Mass Production of Reliable Microarrays

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Overview

- Biochip production technologies at PicoRapid
- Optimization of the microarray production process
- Performance of standardized microarrays

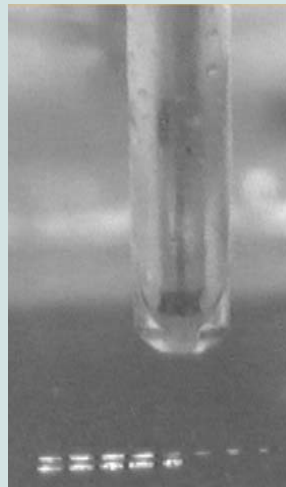
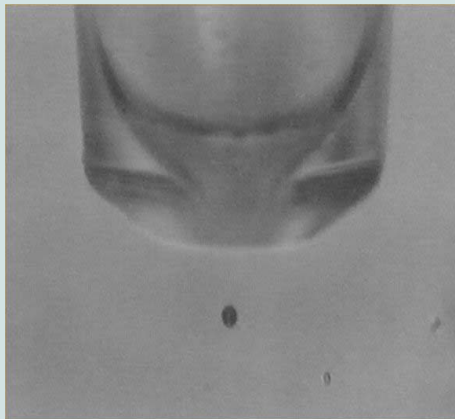
Core Technologies at PicoRapid

- Micro-Pipetting Technology
- Slide Surface Chemistry

Core Technologies at PicoRapid Non-Contact Pipetting/Spotting

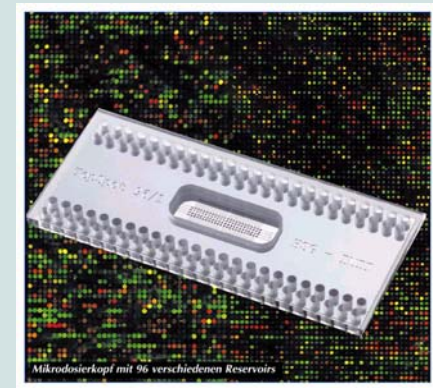
Piezo Pipettes (*PicoPipettes™*)

- Volumes of 500 fl to 700 pl
- Volume reproducibility better than 1%



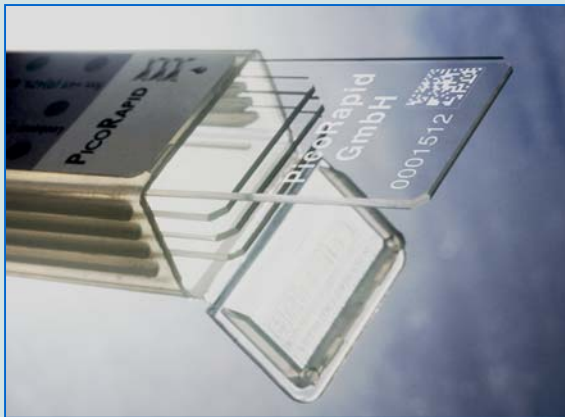
Top Spot

- Volumes of about 250 pl
- Volume reproducibility better than 1%
- Parallel pipetting 24, 96, (384)



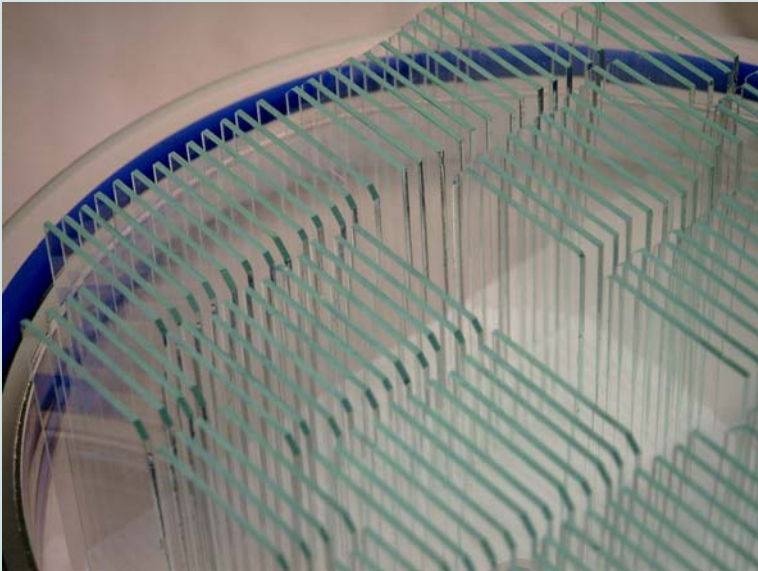
Core Technologies at PicoRapid Slide Surface Technology

- Isothiocyanate surface chemistry (*PicoSlides™*)
- Covalent attachment of amino modified DNA
- Stable and high binding capacity externally confirmed
- Useful for protein arrays



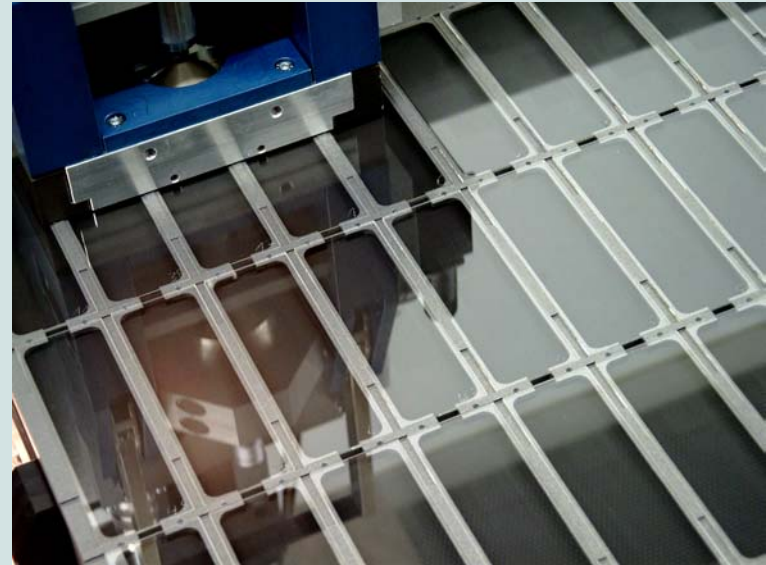
Slide and Microarray Production Facilities

PicoSlides™ Production



- 25000 slides p.a.

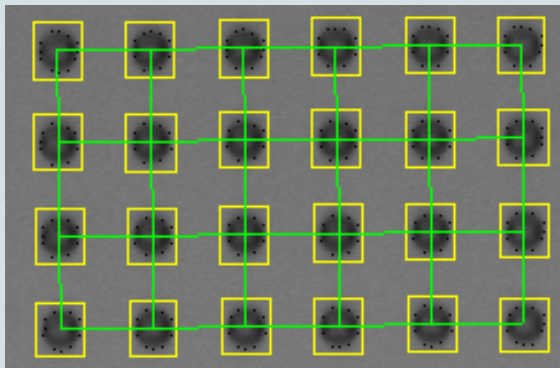
PicoArrays™ Production



- 25000 microarrays p.a. with up to 1000 and more different features

3 Step Quality Control for Array Production

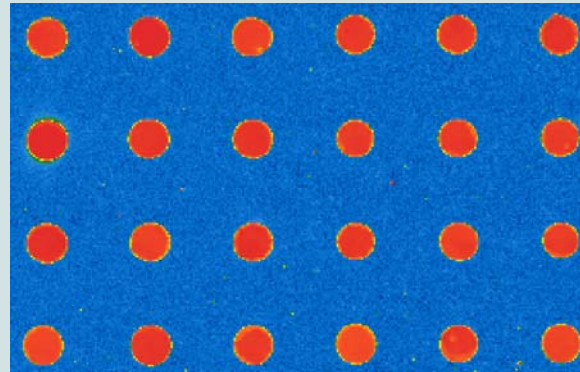
1.



Online process control

The morphology and localisation of each spot on each PicoArrayTM is monitored

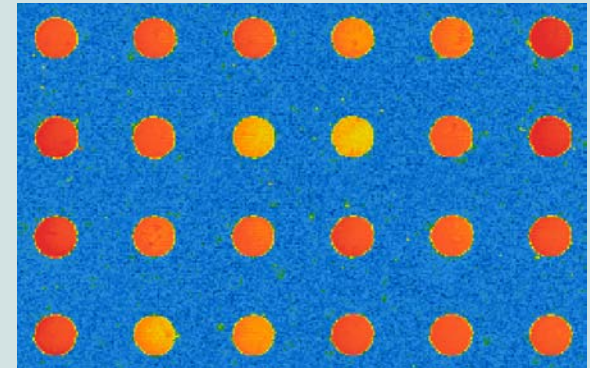
2.



DNA-staining

The presence of DNA in each spot is confirmed

3.



Random-hybridisation

The accessibility of the immobilised DNA for hybridisation is confirmed

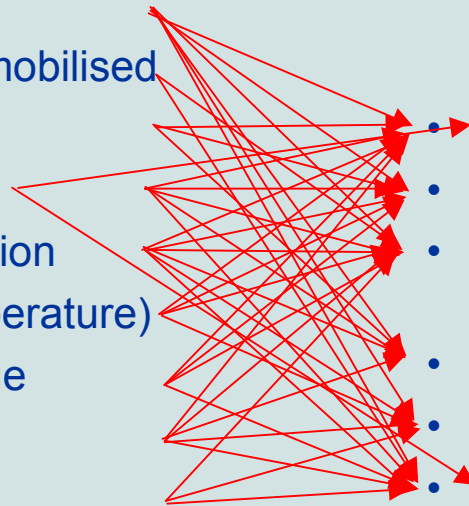
Optimizing the Microarray Production Process

Microarray production process

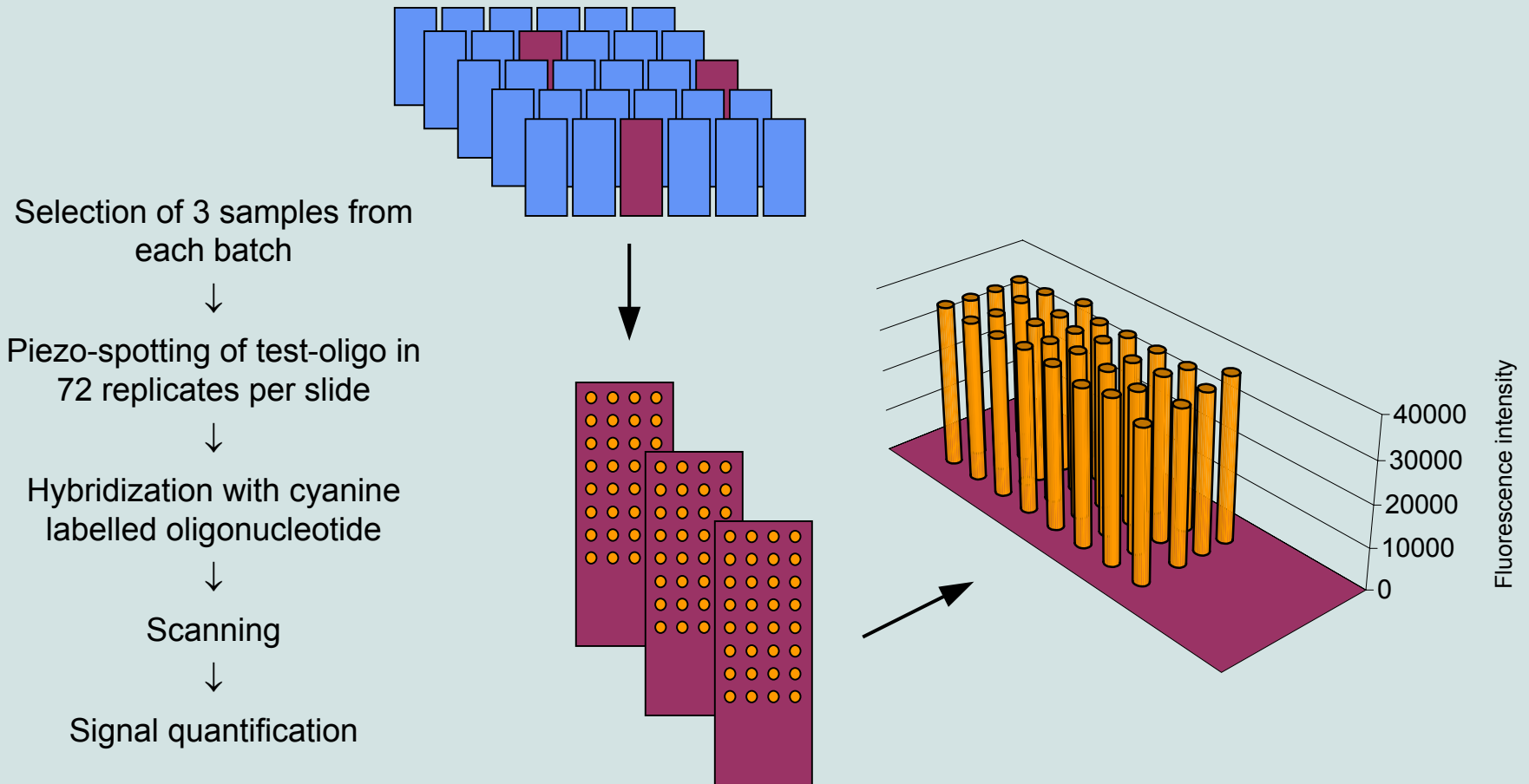
- Slide surface (chemistry)
- Capture molecules to be immobilised
- Printing / spotting system
- Printing / spotting buffer
- Printing / spotting concentration
- Environment (humidity, temperature)
- DNA immobilisation technique
- Array processing / blocking
- Packaging and storage

Microarray quality features

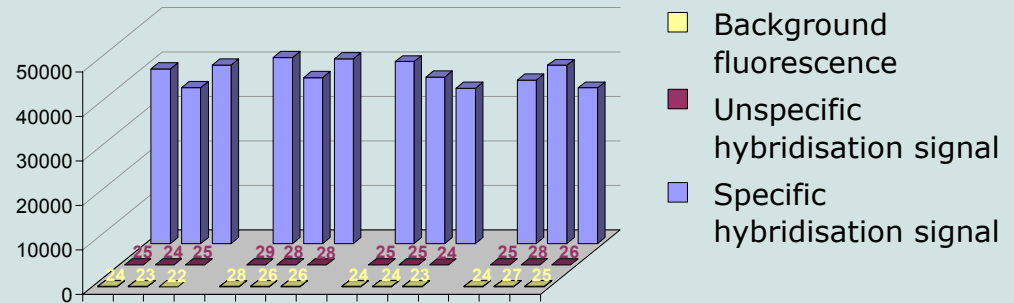
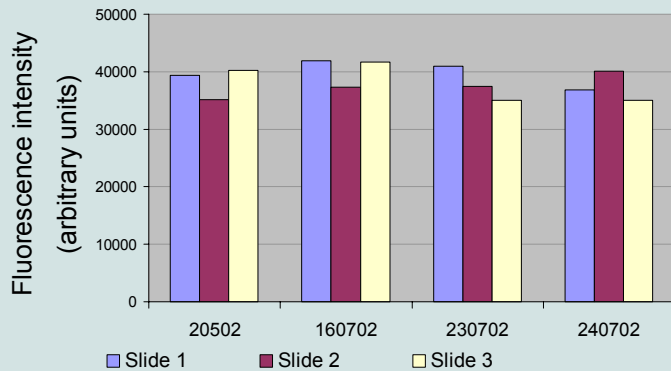
- Spot shape (circularity / size uniformity)
- Intra-spot signal uniformity
- Binding capacity of spots (signal intensity)
- Inter-spot uniformity (reproducibility)
- Slide background
- Spot background



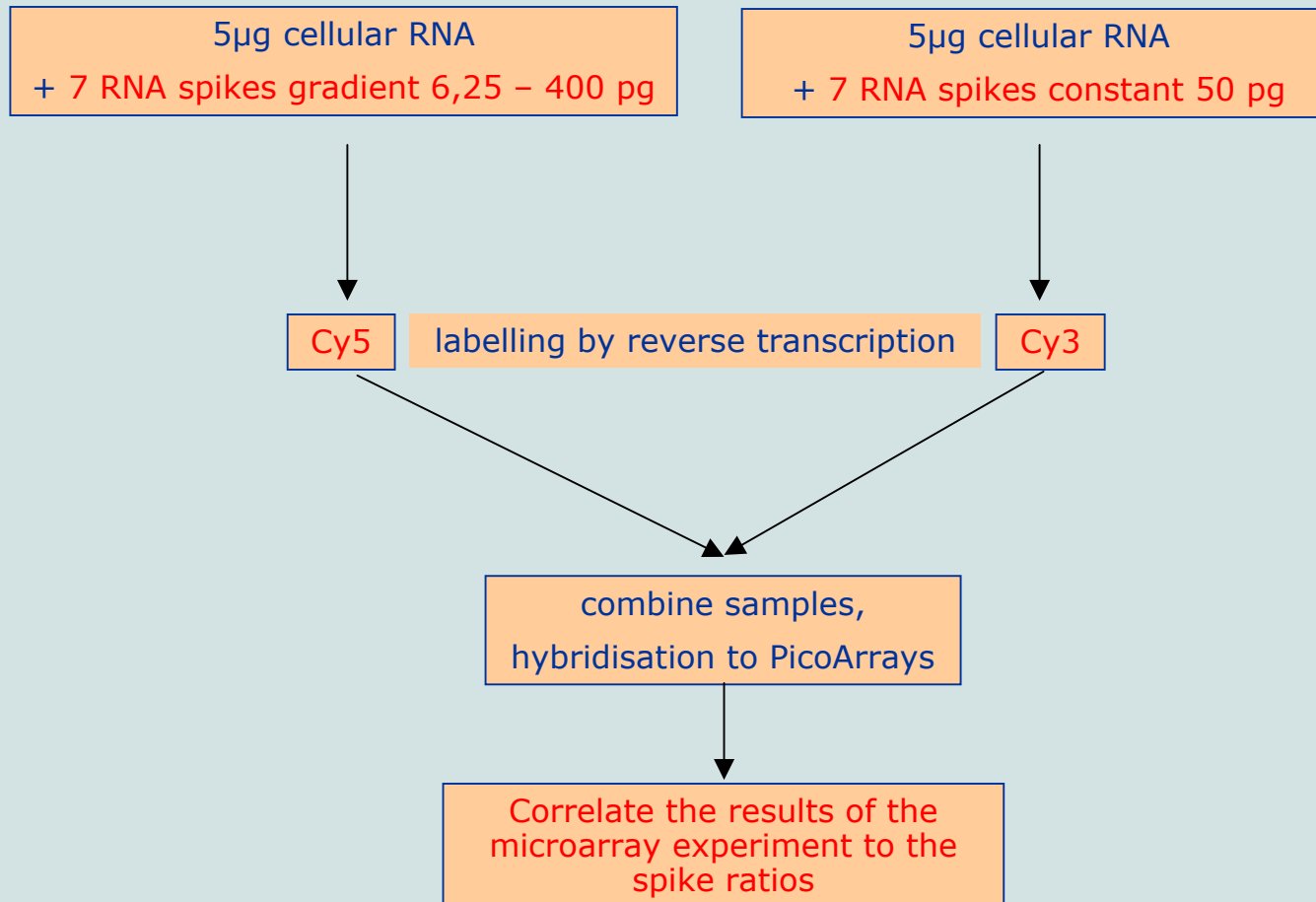
Hybridisation Assay



Test of Production Process with Hybridisation Assay



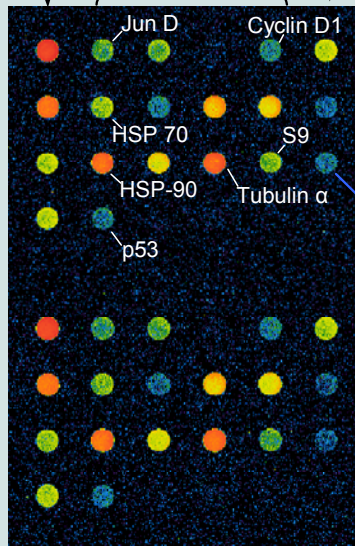
Evaluation of Microarray Performance: Expression Analysis Test Assay



Superior Sensitivity in Gene Expression Analysis

Cy5

RNA-spikes at different concentrations
various gene specific oligos



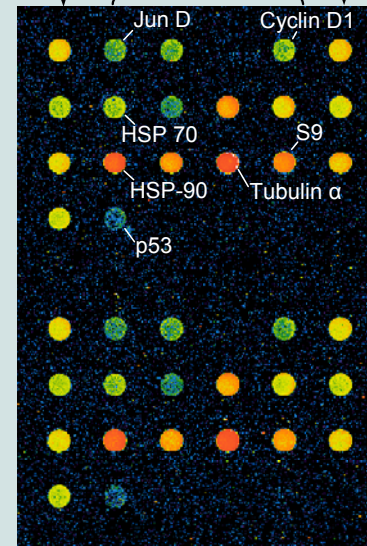
Array 1

0,01 fmol
(6,25 pg RNA)

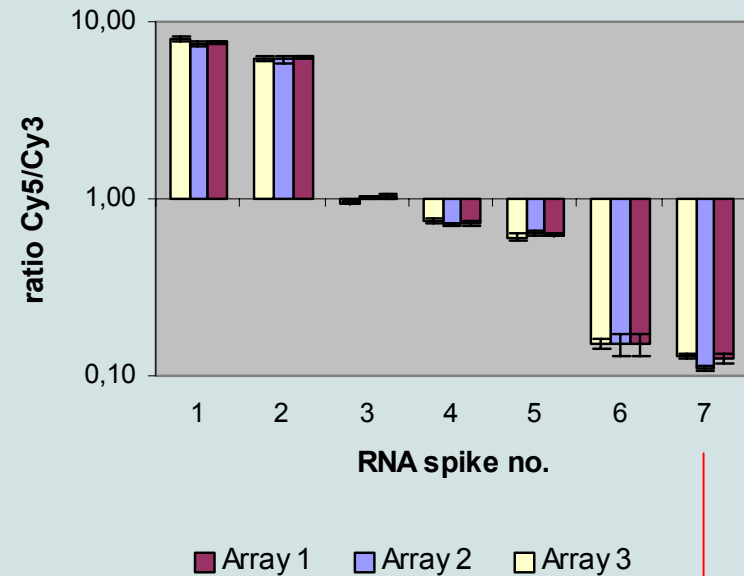
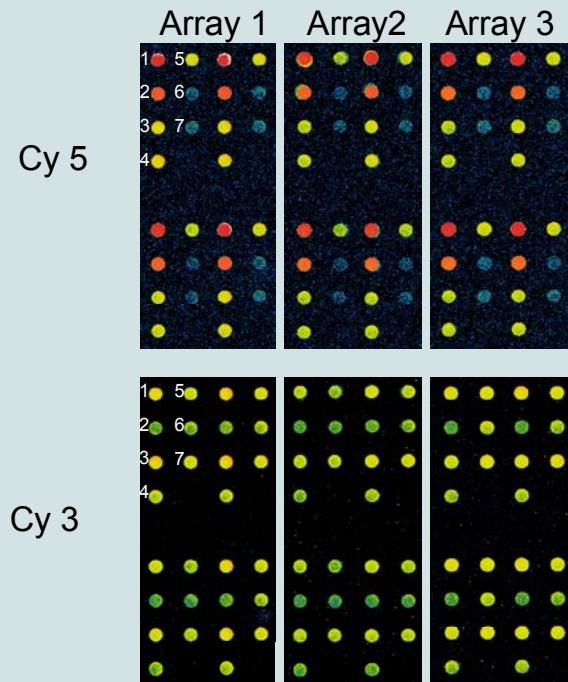
Array 2
(Duplicate)

Cy3

RNA-spikes 50 pg each
various gene specific oligos

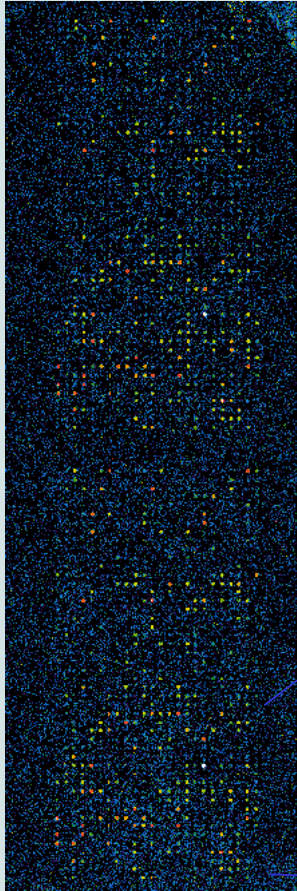


Reproducibility of Gene Expression Analysis

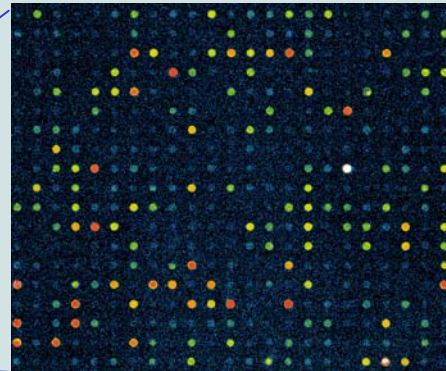


0.01 fmol mRNA
(6.25 pg)

PicoArrays™ in Comprehensive Study about Reproducibility of Microarray Analysis

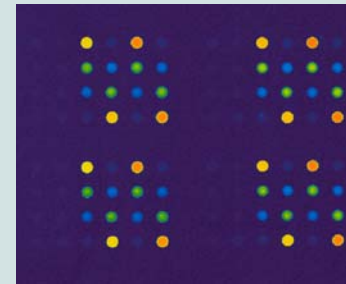
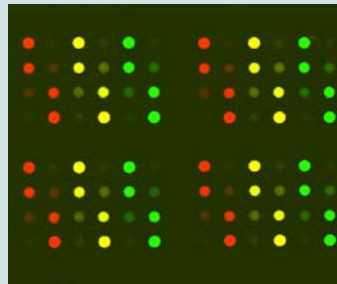
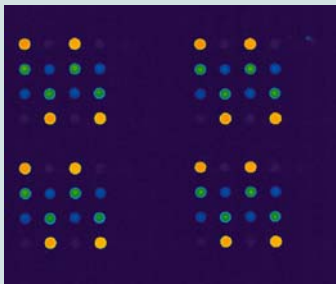


- **External study** at customer's site
- Involves **200 PicoArrays™**, each consisting of 1200 cDNAs in duplicates = 2400 spots
- **Preliminary Results:**
 - **Max. 8%** spot to spot variation
 - Differences in gene expression of **only 20%** can be reliably measured (one colour analysis!)



PicoRapid: Microarrays and Microarray Services of Outstanding Quality

- Non-contact spotting of DNA and protein solutions
- Rigorous quality control from the slide to the microarray
- Functionally validated products in order to guarantee highest specificity and sensitivity
- Reliable products for reproducible results in routine applications
- Comprehensive services for manufacturing of tailored microarrays according to our customers needs
- Powerful research collaboration with the Centre of Applied Gene Sensoric (CAG) at University of Bremen.



PicoRapid – Products and Services that meet **Highest Quality Standards**

- ***PicoSlides™***
Highest binding capacity and stable, covalent binding of DNA and proteins, confirmed by external institutions (EMBL), isothiocyanate chemistry on standard slide format.
- ***PicoArrays™ - Custom:***
Spotting-Service (non-contact piezo technology) for oligonucleotides (10 to 80 mers), cDNA, PCR products, plasmids and proteins
- ***PicoArrays™ - Apoptosis***
Optimized microarray for analyzing the expression of over 350 apoptosis related genes
- ***PicoArray™ - Rheumatism***
Optimized microarray for analyzing the expression of over 150 rheumatism related genes
- ***PicoArrays™ - Training Kit***
Complete Training-Kit for microarray based analysis of gene expression
- ***PicoService™***
Microarray services from design and synthesis of microarray probes to full service including probe labelling, hybridisation and scanning and documentation of results.
- ***PicoPipettes™***
Piezo-Glaspipettes for picoliter volumes

PicoRapid Team

Production

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Heike Wehning, Chemist
Dr. Guido Mix, Physicist

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Managing Directors

Dr. Michael Wolf
Prof. Dr. Dietmar Blohm

Sieglinde Hartmann, Secretary

