

# CodeLink™ multi-assay bioarray

## High throughput and robust experimental results from focused bioarrays

The CodeLink™ multi-assay bioarray features a new multi-assay chamber that allows up to 16 samples to be hybridized, washed, and detected in parallel on a single slide (Fig 1). Especially for high-volume microarray users that require flexibility for custom arrays, this latest CodeLink™ bioarray format offers increased throughput and cost efficiencies with a robust experimental protocol.

- **16 identical arrays** spotted on each bioarray slide and separated by individual hybridization chambers.



**Fig 1.** CodeLink™ multi-assay bioarray chamber allows for processing of up to 16 arrays and samples in parallel on a single slide.

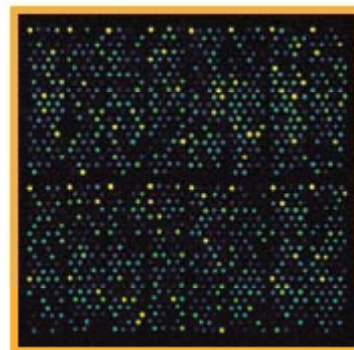
The CodeLink™ multi-assay bioarray delivers superior results through proven CodeLink™ core technologies and processes:

- Quality probe design and selection that includes functional validation for accurate and reproducible biological results.
- Unique 3-D aqueous gel matrix for higher assay sensitivity and specificity.
- Six Sigma manufacturing processes and control checkpoints to ensure probe and deposition quality for reproducible experimental results.

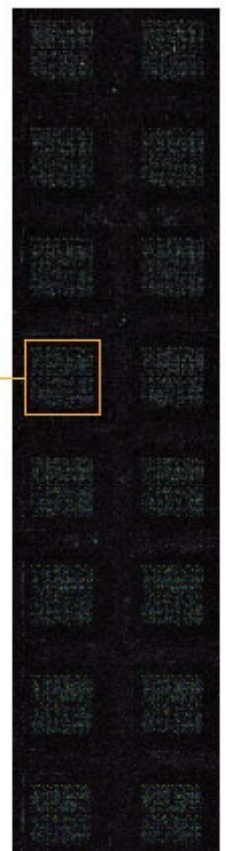
- **High throughput in a robust assay that can be automated.** With three bioarrays used together on a microtiter tray, 48 arrays can be processed as a single unit, making this format ideal for automation.

- **Open system format.** The multi-assay bioarrays can be detected by scanning using commonly available microarray scanners (Fig 2). Images generated can be easily analyzed with CodeLink™ Expression Analysis software and the data further visualized and mined with commercially available microarray data analysis applications.

- Optimized reagents, protocols, processing tools, and software for ease of use and reliable performance.



**Fig 2.** Scanned image of CodeLink™ multiassay bioarray. 16 arrays are printed and individually hybridized for each bioarray. Images can be generated utilizing common microarray scanners.



## Proprietary technology for high sensitivity and specificity

The core of every CodeLink™ bioarray is a 3-D aqueous gel matrix. Specially designed attachment chemistry immobilizes amine-terminated oligonucleotide probes, allowing for greater target access to probes and better sensitivity—a key benefit over 2-D surfaces. In addition, the 3-D aqueous gel matrix enables higher specificity of the CodeLink™ 30-mer probe compared with longer probes—without compromising signal intensity. With this improved matrix, sensitivity of detection is less than 1:1,000,000 mass ratio, determined by spiking experiments at the cRNA level, for enhanced detection of low abundance transcripts (Table 1).

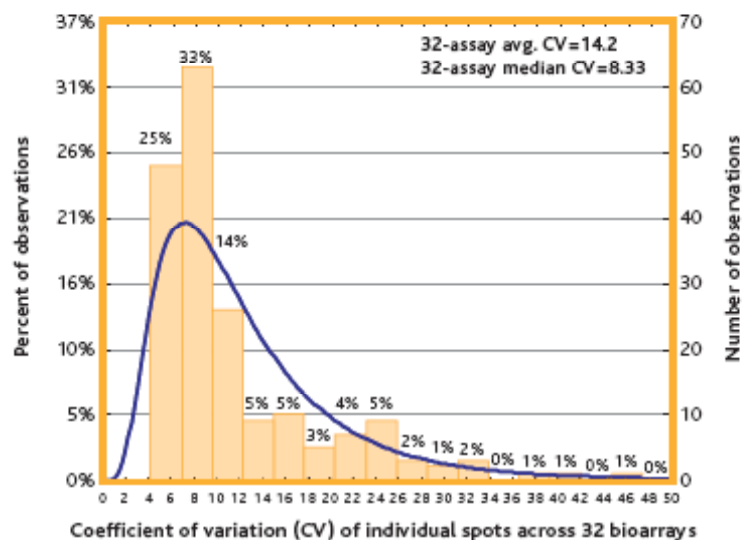
## Robust assay for high experimental reproducibility

CodeLink™ multi-assay bioarrays are designed and manufactured under strict quality control. The result is highly reproducible performance between assays and among bioarrays and production batches (Table 1, Fig 3).

## Performance

	Typical performance	Benefit
<b>Sensitivity</b>	Mass ratio <1:1,000,000 with bacterial spiking into cRNA and total RNA level	Detection of more low abundance genes (< 0.3 copies per cell)
<b>Dynamic range</b>	Linear signal response of three orders of concentration magnitude (0.05 pM – 50 pM)	More usable/accurate data across a broad range of gene expression levels
<b>Specificity</b>	Discrimination of > 2 base mismatches	Better discrimination of highly homologous genes
<b>Signal reproducibility</b>	Typically < 15% total median CV among batches, all probes included; ~8% median CV among production batches, for probes above noise	Reproducible differential expression results in every experiment (Fig 3)
<b>Minimum detectable fold change</b>	> 98% within two-fold change for replicates	Reduced noise for better detection of small changes in gene expression and more usable data per bioarray

**Table 1.** CodeLink™ Multi-assay Bioarray performance.

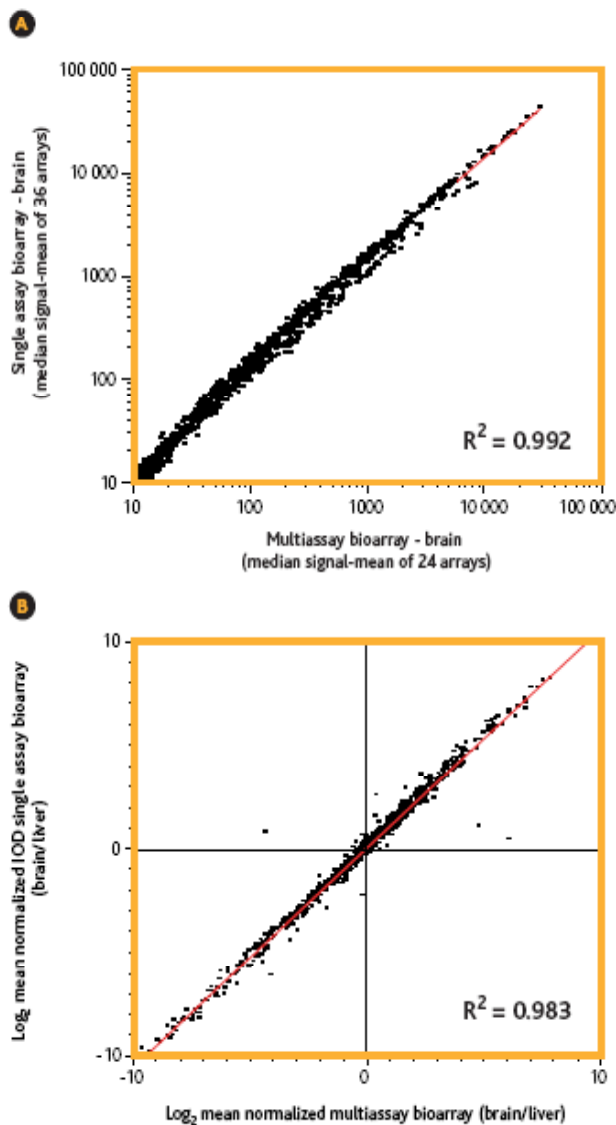


**Fig 3.** CodeLink™ multi-assay bioarrays exhibit high signal reproducibility. This experiment used all 16 arrays across two slides. The same target— mouse heart with bacterial spikes at 1:300,000 level—was used on all arrays. The blue line is a fitting line using lognormal-type fitting method.

## Specifications

<b>Number of bioarrays per package</b>	1 or 3
<b>Number of arrays per 1 x 3-in bioarray</b>	16
<b>Number of probes per array</b>	<1800
<b>Number of transcripts</b>	Variable
<b>Number of discovery genes</b>	Variable
<b>Positive controls</b>	18
<b>Negative controls</b>	18
<b>Number of probes per gene</b>	one specific and functionally validated probe
<b>Oligo probe length</b>	30-mer
<b>RNA sample input</b>	0.1–2 µg total RNA
<b>Hybridization assay parameters</b>	60 µl hybridization volume and 1 µg cRNA target per assay per well
<b>Type of assay</b>	One color
<b>Storage and handling temperature</b>	room temperature

**Table 2.** CodeLink™ ADME Rat 16-Assay Bioarray specifications.



**Fig 4.** CodeLink™ multi-assay bioarrays exhibit high signal and expression ratio correlation with the CodeLink single assay bioarrays. In this experiment, the targets used were: rat liver with bacterial spikes at cRNA level (1 ng for every 300,000 ng rat liver cRNA); and rat brain with bacterial spikes at 1:100,000 made by adding bacterial spike mRNA to rat brain total RNA prior to cRNA target preparation. The single assay bioarray was hybridized with 5 µg cRNA per array, and the 16-assay bioarray with 0.9 µg cRNA per array. Panel A shows signal reproducibility between the single and 16-assay bioarray formats. For the single assay bioarray, 36 arrays were hybridized. For the 16-assay bioarray, 24 arrays were hybridized. Panel B shows ratio reproducibility between the two bioarray formats. Panel B shows the average of the same replicates for each target type that were used in Panel A. Results include discovery probes only.

### High-quality content for focused biological applications

CodeLink™ ADME Rat 16-Assay Bioarray utilizes the multi-assay bioarray format and is currently available as a catalog item. CodeLink™ ADME Rat 16-Assay Bioarrays are designed to deliver biologically relevant results for ADME and toxicology studies. Each bioarray contains 16 arrays—each with ~1280 single-stranded oligonucleotide probes derived from publicly available, well-annotated mRNA sequences found in the Rat UniGene set of unique clusters (Table 2). Each sequence was carefully screened to reduce gene redundancy and design high-quality, specific probes. Every probe is functionally validated to ensure reliable performance for ADME and toxicological applications.

### High data correlation between CodeLink™ bioarray formats

CodeLink™ multiassay bioarrays exhibit excellent signal and ratio correlation with the CodeLink™ single-assay bioarrays that utilize the Flex Chamber (Fig 4). This allows for data comparison between catalog whole genome bioarrays and catalog or custom multi-assay bioarrays derived from this same library of probes.

### Additional tools for optimal performance

The CodeLink™ System is an open platform compatible with existing microarray technology. For optimal performance, the CodeLink™ iExpress Assay Reagent Kit provides the required reagents and an easy-to-follow protocol for target preparation, including cDNA synthesis and *in vitro* transcription. This high-yield reagent kit produces sufficient amplified material for multiple replicate experiments. Optimized processing fixtures that include a Universal Shaker Tray and 3-Slide Bioarray Tray are available for easy and efficient handling of the multi-assay bioarrays (Fig 5). Three CodeLink™ 16-Assay Bioarrays can be processed as a set in the 3-Slide Bioarray Tray that is the size of a microtiter plate. The format can be automated for handling with liquid handling robots or commercially available plate washer instrumentation. CodeLink™ Expression Analysis software provides for accurate data extraction and integrates manufacturing quality control and gene information with spot-finding and primary data analysis features.



**Fig 5.** Universal Shaker Tray for easy processing of all CodeLink™ bioarray formats. 3-Slide Bioarray Tray for efficient handling of CodeLink™ multi-assay bioarrays.

## Ordering information

Description	Size	Code number
<b>CodeLink™ Human Inflammation v1 16-Assay Bioarray, 3 Pack</b>	<b>3/pack</b>	<b>300076-3pk</b>
<b>CodeLink™ Human Inflammation v1 16-Assay Bioarray</b>	<b>1/pack</b>	<b>3000276-1pk</b>
<b>CodeLink™ Mouse Inflammation v1 16-Assay Bioarray, 3 Pack</b>	<b>3/pack</b>	<b>300072-3pk</b>
<b>CodeLink™ Mouse Inflammation v1 16-Assay Bioarray</b>	<b>1/pack</b>	<b>300072-1pk</b>
<b>CodeLink™ Rat Inflammation v1 16-Assay Bioarray, 3 Pack</b>	<b>3/pack</b>	<b>300077-3pk</b>
<b>CodeLink™ Rat Inflammation v1 16-Assay Bioarray</b>	<b>1/pack</b>	<b>300077-1pk</b>
<b>CodeLink™ iExpress Assay Reagent Kit</b>	<b>24 reactions</b>	<b>67601000</b>
<b>Universal Shaker Kit, 12 slides</b>		<b>310031</b>
<b>Multi-assay Accessory Kit (processing trays)</b>		<b>310032</b>
<b>CodeLink™ Expression Analysis v5.0 software</b>		<b>310035</b>

For further information, please contact the Applied Microarrays, Inc. sales office below.

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CodeLink™ Bioarrays are for research purposes only.

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