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FOOD DIAGNOSTICS

# **White Paper:** Biochip array technology: an effective and reliable multi-analytical tool for comprehensive screening of drug residues from a single sample over a range of matrices.

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## Aim

Multiplex screening of a broad range of drug residues from a single sample over a range of matrices with a single analytical platform.

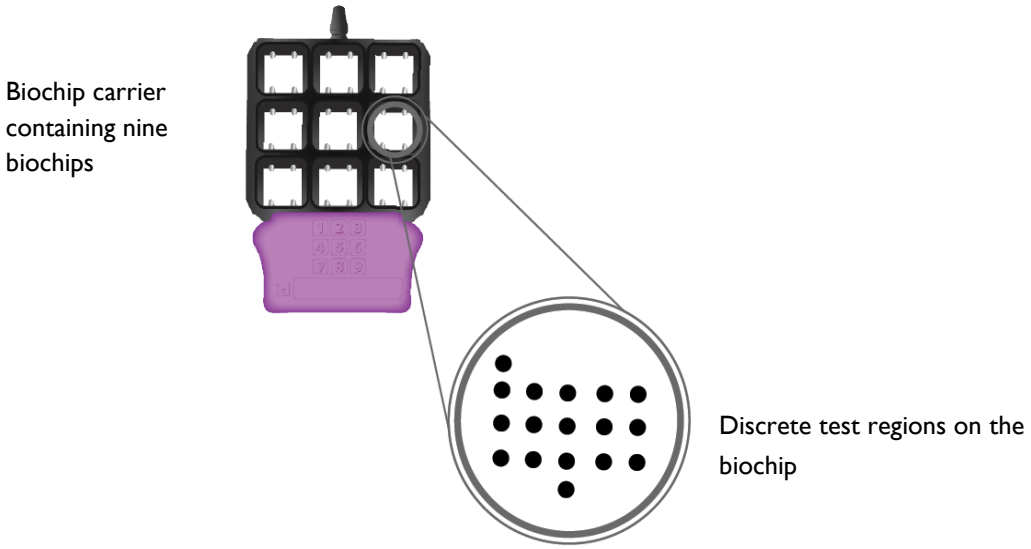
## Biochip Array Technology

Biochip Array Technology (BAT) provides a platform for the simultaneous determination of multiple drug residues from a single sample using miniaturized immunoassays with implications in the reduction of sample/reagent consumption and an increase in the output of test results.[1,2]

*The biochip: the core of the technology*

The core of the system is the biochip (9mm x 9mm) and represents the platform in which the capture molecules are immobilized and stabilised in pre-defined x,y coordinates defining arrays of discrete test regions (DTRs) on a pre-activated surface (Figure 1). Up to 25 tests can be carried out per biochip. The biochip is also the vessel where simultaneous chemiluminescent immunoreactions take place. The biochips are supplied in carriers containing 3 x 3 biochips, which is equivalent to nine reaction wells per carrier, where samples and reagents are added (Figure 1). A carrier handling tray is provided with the system, which allows the simultaneous handling of six carriers (54 biochips).

Figure 1




The kinetics of the immunoassays are controlled by incubating the biochip carriers in a custom thermoshaker unit provided with the system (Figure 2).

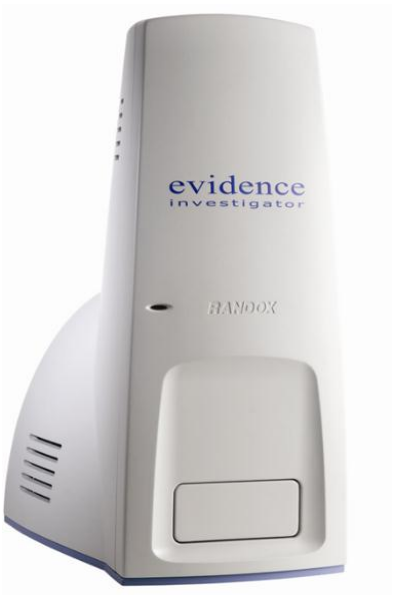
Figure 2. Thermoshaker

After completion of the immunoreactions a signal reagent is added for the detection of chemiluminescence produced at the different DTRs on the surface of each biochip. The addition of sample, reagents and washing steps are carried out manually whereas the detection and processing of test results are automated operations performed by the biochip analyser Evidence Investigator.

*Evidence Investigator analyser: the biochip test platform for drug residues*

The biochip carrier is inserted in the light-tight compartment in the image station of the semi-automated bench-top analyser Evidence Investigator (Figure 3). The chemiluminescent signal from each DTR on the surface of the nine biochips contained in a carrier is simultaneously detected and recorded in the imaging station. Image processing, quantification and validation are carried out by instrument specific software.

Figure 3 Evidence Investigator




*Sample Preparation*

Before samples are added to the biochips for analysis some preparation steps are required these are minimal and are matrix dependant. Preparations vary from simple

dilution, homogenisation, and extraction and for some samples no preparation is required.

**Multiple drug residues screened with Biochip Array Technology**

Biochip Array Technology is being used in various industries throughout the world for the analysis of drug residues. Some of the most prevalent residues currently being detected with BAT include:

- Beta- Agonist
- Coccidiostats
- Corticosteroids
- Nitrofurans
- Nitroimidiazoles
- Sulphonamides
- Tetracyclines

Drug residues like the above are being detected faster and easier with BAT in multiple sample types including meat, seafood, honey, milk and urine. The biggest meat processors, fisheries, honey producers, dairies and private laboratories are utilizing this technology to improve their testing regimes and to protect their consumers.

Studies related to the detection of antimicrobials in different matrices using BAT have been reported [3-9] as well as the application of this methodology to the detection of more than twenty anthelmintic drugs.[10]

Recent developments in the technology relate to multi-mycotoxin detection for the feed and grain industries with the use of the new Myco range of arrays. The mycotoxins biochip arrays enable the screening of multiple mycotoxins including fumonisins, ochratoxin A, deoxynivalenol, T-2 toxin, aflatoxin B1, and zearalenone. The assessment of samples for all available mycotoxins and sample types (animal feed, maize and wheat flour) from FAPAS$^{R}$ proficiency testing programme and FAPAS$^{R}$ QC showed that all values obtained with the mycotoxins biochip array fell within the range assigned by FAPAS$^{R}$ for samples contaminated with a single or multiple mycotoxins.

**Conclusion**

Biochip Array Technology from Randox Food Diagnostics is a market leading multi-analytical method for the detection of drug residues. Applicable to multiple matrices and multiple industries the technology offers users:

- Higher screening throughput as allows the screening of multiple analytes from a single sample
- Excellent analytical performance
- Analysis of batches of samples as 54 biochips can be handled at the same time with the Evidence Investigator system
- Less than 5% false positives
- Simple sample preparations

For more information contact enquires@randoxfood.com or visit randoxfood.com

## References

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