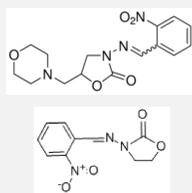


DEVELOPMENT OF A RAPID MULTI-ANALYTE LATERAL FLOW TEST TO DETECT ANTIBIOTICS IN HONEY

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BACKGROUND

Nitrofurans and other synthetic broad spectrum antibiotics such as chloramphenicol and tetracycline are widely used in animal production to treat microbial infections, or as feed additives to stimulate growth. Due to their suspected carcinogenic and mutagenic characteristics they are prohibited in the food industry in several countries, including the European Union.



Food products such as honey are monitored for drug residue presence, however, rapid multi-drug analysis are primarily restricted to laboratories. In this study, the LOGIC project, a rapid, simple and cheap multi-target test will be developed for on-site antibiotic testing.

LOGIC PROJECT

The objective of the EU-funded Eurostars project LOGIC (www.logic-multiplex.com) is to develop a prototype kit for multi-analyte antibiotic screening in several food matrices that will be suitable for use by the food industry. The kit provides a rapid and simple tool that can be used with minimal expertise, to monitor honey samples for 7 key antibiotic targets relevant for honey legislation at the factory workplace.



Figure 1. Lateral flow Microarray ImmunoAssay.
Example of a LMIA one-step test cartridge where every dot represents an individual assay. The sample is directly applied to the cartridge and results will be visible in the window.

The test device, the Lateral flow Microarray ImmunoAssay (LMIA) is a rapid, multi-analyte test platform, comparable to the well-known pregnancy hormone test, but with spots instead of lines. Each spot represents a single test. Hence, running one sample in LMIA will give signals for up to 8 different analytes including control spots.

LATERAL FLOW MICROARRAY IMMUNOASSAY

For on-site performance, a rapid uniform sample preparation method will be included in the assay. Honey sample extracts will be directly added to the LMIA test cartridge (Figure 2) and placed in a dedicated reader. If antibiotics are present in the honey, antibiotic-specific spots will appear in the cartridge window. The project's aim is to have a time-to-result of less than 10 minutes/sample.

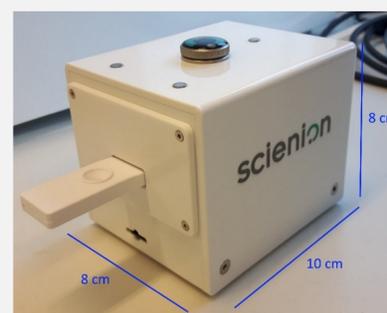
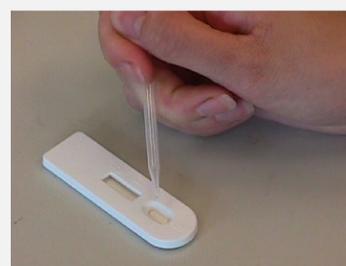


Figure 2. Multi-target lateral flow assay procedure.
Honey extract is directly applied to the test cartridge and placed in the reader for analysis of the test results. These (processed) results appear on a smartphone/tablet.

Test results will be read using a new and innovative reader. The video reader analyses the developing spots in real-time. The standalone reader can be controlled wirelessly by a smartphone and the results (qualitative/quantitative) can be transferred to dedicated receivers within the honey plant.

RESULTS/CONCLUSION

Preliminary results of singleplex competition lateral flow immunoassays for AMOZ and AHD are shown below (Figure 3). When the target antibiotic is present in the sample, spot development is inhibited showing that sensitivity will be less than the required EU MRL of 1ppb.

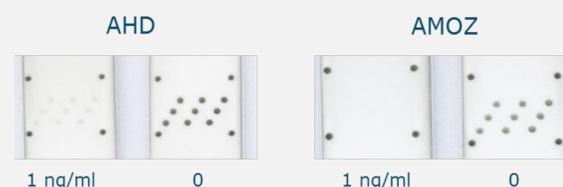


Figure 3. Singleplex nitrofurans LMIA.
Examples of developed singleplex lateral flow assays for the detection of AHD (left) and AMOZ (right).

These singleplex assays will be combined to develop a multi-target test prototype, for the detection of antibiotics of 4 drug families: nitrofurans, chloramphenicol, nitroimidazoles and tetracyclines. This prototype will offer a unique multiplex test that will enable honey producers to easily incorporate into their 'factory floor' to give results in less than 10 minutes, with excellent accuracy and sensitivity to meet EU regulations.