Sensovation AG: a special camera for rapid allergy diagnosis

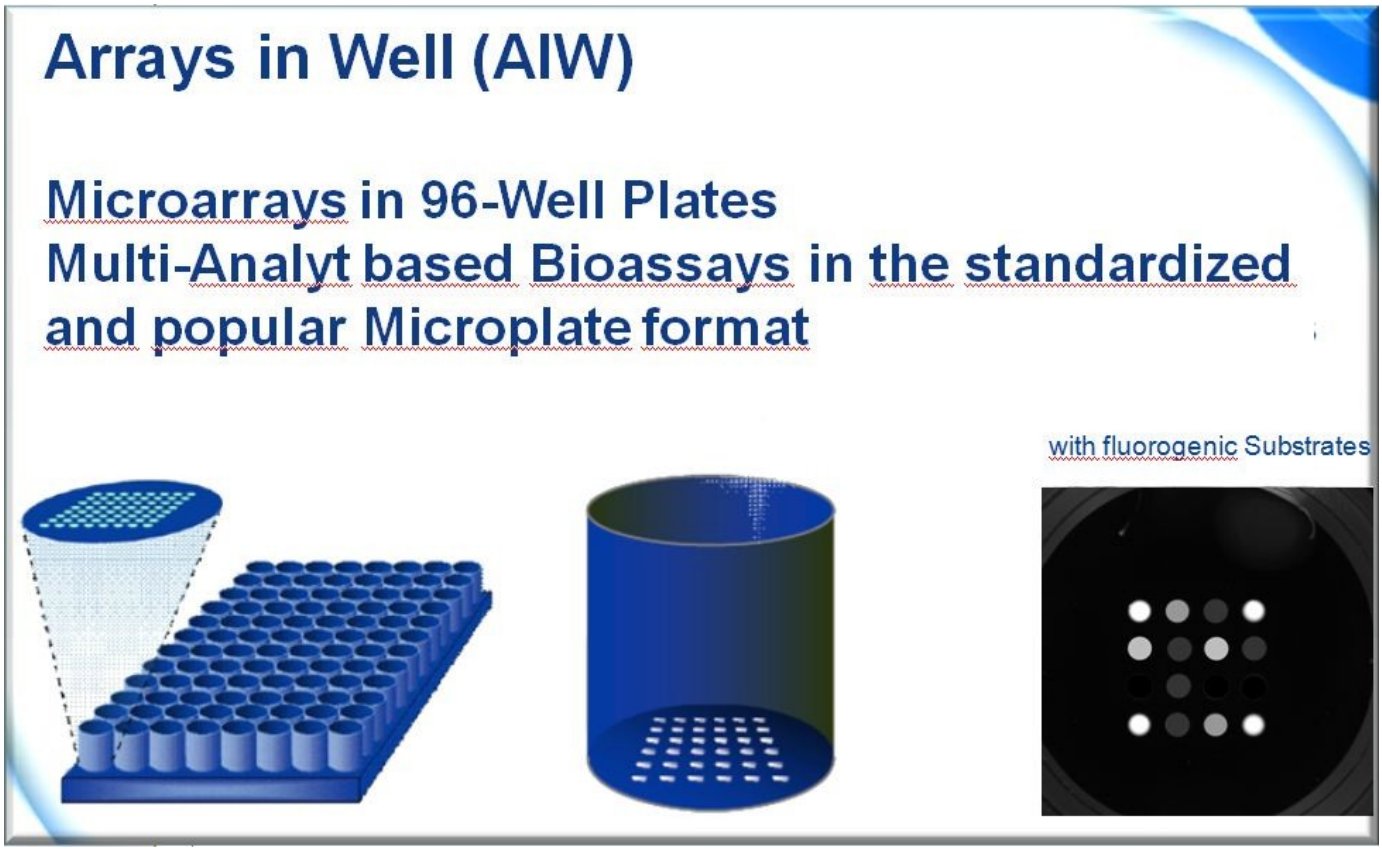
Between 20 and 30 million Germans suffer from allergies to house dust mites, pollen and many other allergens[1]. The diagnosis of allergies is usually a rather time-consuming process as more than 20,000 potential allergens need to be tested in order to identify the allergen that causes a patient's particular symptoms[2]. Sensovation AG has developed a technology that allows the parallel analysis of 20 allergens and which has the potential to simplify and accelerate the diagnosis of allergies in the future. Founded in 2000, the Radolfzell-based company is focussed on the development and commercialisation of optical detection systems.

Almost one in three German suffers from an allergy; however, the allergy often goes undetected and the cause of the allergic reaction is not identified. That said, early and accurate diagnosis is crucial for the appropriate treatment and prevention of chronic diseases such as asthma. The diagnostic procedure for allergies usually consists of the following steps: the person suspected of having an allergy first consults his/her GP to discuss the symptoms. The GP may then carry out tests to identify the allergen that is causing the symptoms, including a skin test, laboratory tests and a provocation test. Skin allergy testing usually involves prick tests in which a few drops of the potential allergen are gently applied with a needle onto the surface of the skin. The test can be very uncomfortable for the patient as a large number of allergens need to be applied to the skin, making the skin red and itchy whenever the test is positive. The test needs to be repeated if the allergy-causing allergen was not among those tested. Sensovation AG recently placed on the market a device that enables the simultaneous analysis of numerous allergens in a blood sample. This assay therefore represents a quick and reliable alternative to currently used tests.

Multiplex diagnostics: testing 20 allergens simultaneously

96-well plate-based enzyme-linked immunosorbent assays (ELISA) are routinely used for the biochemical diagnosis of allergies; they are based on determining the concentration of IgE (immunoglobulin E) in a blood sample. "IgE antibodies are instrumental in the immune system's response to allergens; they bind to antigens, which results in an allergic reaction," says Hanswilly Müller, Head of Marketing at Sensovation AG.

The binding of IgE and allergen can be detected in in-vitro assays and indicates the presence of an allergy. "Multiplex diagnostics involves the use of microarrays, i.e. parallel arrangements of different substances, with which a small blood sample can be analysed for the presence of more than 20 allergens in parallel," Müller says explaining that their platform involves the use of 96-well plates where each well contains a microarray with around 20 different allergen extracts which can bind to specific IgE antibodies in the blood sample. The blood sample is then washed off and the IgE-antigen



The individual wells of 96-well plate contain microarrays of 20 different allergens.
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complexes are fused with a fluorescence marker protein by way of a second immunological reaction.

The positive spots, i.e. IgE-antigen complexes, are subsequently detected with a fluorescence imager and analysed further. Sensovation AG develops and manufactures such imagers. "We specialise in the development and manufacture of highly sensitive CCD platforms (CCD = charge-coupled device, light-sensitive electronic elements) for the detection and analysis of multiplexed protein assays and also offer array imaging readers based on this CCD-camera based technology," Hanswilly Müller says. "The diagnosis of allergies is an excellent example of a suitable application for this technology as it provides comprehensive diagnostic information due to the large number of parameters that can be analysed simultaneously," Müller adds.

Rapid results thanks to FLAIR (Fluorescence Array Imaging Reader)

Sensovation AG's camera-based imaging reader FLAIR (Fluorescence Array Imaging Reader) can be used for the multiplex analysis of microarrays. FLAIR consists of a mechanical system that moves the 96-well plate, an illumination system for excitation of the fluorescent dyes and high-sensitivity CCD sensors for detection. The resulting fluorescence pattern of the microarray is recorded automatically and analysed in real-time. "The instrument takes a fluorescence image of each well of the 96-well plate," Hanswilly Müller explains. The instrument also comes with software that analyses the images in real-time, calculating the intensity and position of each microarray spot. These results are used to make a diagnostic statement.

FLAIR enables the diagnosis of a blood sample of only a few microlitres and an incubation time of just 30 minutes. Its compact assembly makes the device ideal for application in routine laboratories. The allergy test is currently in the development phase and not yet commercially available. However, in future, multiplex diagnostics has the potential to replace the rather uncomfortable allergy prick test.

The FLAIR device enables the parallel detection of 20 allergens.
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Promising research projects for the future

Sensovation AG is currently working on the development of an effective marker system for the detection of certain types of cancer based on so-called microRNAs (miRNAs). "The reliable detection of such cancers must be based on the analysis of a complex profile of 20 or more miRNAs, and multiplex microarray platforms are the perfect tools for doing this," Müller explains. Sensovation manufactures the required hardware and detection systems, while its clinical and academic partners work on the development of biochemical detection methods.

Sensovation AG was founded in 2000 and is headquartered in Radolfzell at Lake Constance, Germany where it employs around 30 people. "Our core competence is the development and manufacture of detection systems involving highly specialised cameras," Müller says. The company's imaging systems are mainly used in the fields of biotechnology and diagnostics. Sensovation also develops suitable software programmes for its technologies. These are required in order to analyse the high density of information recorded by the cameras.

Sources:

[1] Deutsches Ärzteblatt

[2] German Allergy and Asthma Association

Further information:

Sensovation AG
Dr. Hanswilly Müller (Marketing)
Markthallenstrasse 5
D - 78315 Radolfzell
Tel.: +49 7732 30278 20
Fax: +49 7732 30278 39
E-mail: hanswilly.mueller(at)sensovation.com

Article

12-Aug-2013
Elisabeth Plachetta
BioLAGO