



## LAB-ON-CHIP FOR RAPID DIAGNOSIS OF INFECTIOUS DISEASES

Currently a reliable diagnosis of complex and life-threatening infectious diseases like sepsis is only possible using elaborate and time-consuming methods involving a laboratory infrastructure and qualified specialists. Together with different partners from Industry and with support of the German Ministry for Education and Research (BMBF), the Fraunhofer IZI develops an innovative system for rapid, easy-to-conduct and inexpensive on-site infection diagnostics called MinoLab.

### Unique feature

The MinoLab lab-on-chip device is based on magnetic microparticles, which combine different functionalities:

- Allow effective capturing of bacteria- or fungal cells out of patients samples
- Enable electromagnetic transport of attached target cells through the lab-on-chip device
- No need for pumps for microfluidic transport
- Microparticles develop a detectable signal on the surface of a magneto-resistive DNA chip

### Method

The core of this novel device is the nanometer- to micronmeter-sized magnetic particle that can be functionalized according to the field of application. The

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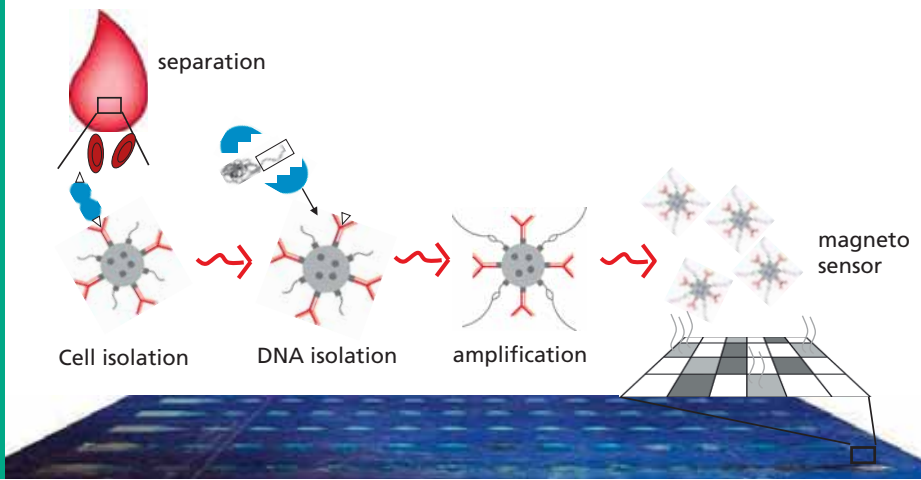
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## Technology principle



particles and all necessary reagents are stored on a single-use cartridge in check card format. In case of an on-site examination, a sample, e. g. blood, saliva or urine, is taken from the patient and applied onto the card. Upon lysis of the target cells, the magnetic particles bind to the respective target molecules contained in the sample and are transported in a fully automated manner through the individual reaction cavities via magnetic forces. At the end of the process chain, detection is conducted by means of highly sensitive magnetic sensor technology – the signals are digitalized and a fully electric read-out is performed.

## Potential applications

Sepsis, blood poisoning, is one important example for a potential application. About half of the approximately 154,000 annual cases of sepsis in Germany must be treated in intensive care and still more than 40 percent of those cases treated result in the patient's death. Treatment is difficult due to the fact that sepsis can be caused by dozens of different pathogens. Moreover, individual classes of these pathogens have already developed a resistance to certain therapeutic agents. The time between blood sample collection and obtaining a diagnostic result still amounts to at least eight hours. By integration of all process steps from sample preparation to detection on the innovative diagnostic platform, we are aiming for a time-to-result of less than two hours. In addition to medical applications such as proteomic, genomic and microbiological tests, the future areas of application also comprise environmental analyses or civil protection measures.

## MicroDiagnostics Unit

In the following areas partners from Industry or academia can find support from experienced and reliable people:

- Development of integrated lab-on-chip devices
- Assay development
- Rare cell diagnostic
- Nucleic acid isolation and purification strategies
- Functionalization of surfaces in the nanometer scale
- Sensor development
- Test strip development
- DNA origami techniques for drug delivery or systematic surface modification