Removal of PCR inhibitors using dielectrophoresis as a selective filter in a microsystem - DTU Orbit (06/01/2019)

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Diagnostic PCR has been used to analyse a wide range of biological materials. Conventional PCR consists of several steps such as sample preparation, template purification, and PCR amplification. PCR is often inhibited by contamination of DNA templates. To increase the sensitivity of the PCR, the removal of PCR inhibitors in sample preparation steps is essential and several methods have been published. The methods are either chemical or based on filtering. Conventional ways of filtering include mechanical filters or washing e. g. by centrifugation. Another way of filtering is the use of electric fields. It has been shown that a cell will experience a force when an inhomogeneous electric field is applied. The effect is called dielectrophoresis (DEP). The resulting force depends on the difference between the internal properties of the cell and the surrounding fluid. DEP has been applied to manipulate cells in many microstructures. In this study, we used DEP as a selective filter for holding cells in a microsystem while the PCR inhibitors were flushed out of the system.

Haemoglobin and heparin-natural components of blood-were selected as PCR inhibitors, since the inhibitory effects of these components to PCR have been well documented. The usefulness of DEP in a microsystem to withhold baker’s yeast (Saccharomyces cerevisiae) cells while the PCR inhibitors haemoglobin and heparin are removed will be presented and factors that influence the effect of DEP in the microsystem will be discussed. This is the first time dielectrophoresis has been used as a selective filter for removing PCR inhibitors in a microsystem.

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