Recombinant antibodies for future immunodetection

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Abstract
The paradigm shift ongoing in rapid diagnostics field requires novel tools to succeed. Traditional methods, such as ELISA and Lateral flow tests using monoclonal antibodies, are well established although having shortcomings. Next generation of immunodiagnostic platforms, including immunosensors, should meet the requirements of high sensitivity, specificity, multiplexing potential, stability, reproducibility, low prize and easy-to-use. Especially the development of a multiplexed assay for many different analytes with varying detection ranges in a single sample has turned out to be challenging.

Recombinant antibodies are small antibody fragments discovered in most cases from antibody libraries displayed on bacteriophages by utilising *in vitro* selection and screening methods. Different antibody formats from single-domain nanobodies to larger Fab-fragments differ in size from ca 2.5 x 4 nm to 3 x 7.5 nm, respectively. Current trend of miniaturization of diagnostic systems increases the demands for surfaces with very high binding capacity. Nanosize recombinant antibodies, which can be tailored for site-specific and oriented immobilization, meet these demands. Antibody engineering can be applied to e.g. improve binding properties or create fusion proteins aiming at further optimization of the immunodetection.

The presentation gives an introduction to recombinant antibodies and their potential to tackle the challenges in future immunodetection of analytes from different application fields. Examples of the utilization of the Fab-fragments in sensitive and specific rapid diagnostic platforms are presented.

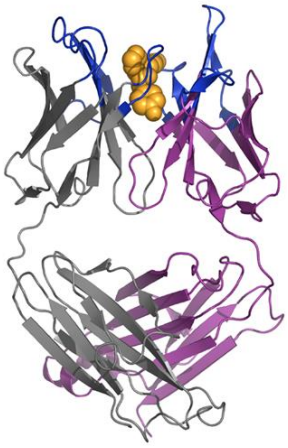

Figure 1: Recombinant antibody Fab fragment contains the intact light chain (grey) and two domains of the heavy chain (magenta) of a monoclonal antibody. Three complementary determining regions (CDR loops in blue) of light and heavy chains create the antigen-binding site responsible for the specificity and affinity of the binding. Target molecule is marked with yellow. (Figure made by Tarja Parkkinen, University of Eastern Finland)