UNIVERSITY OF AMSTERDAM





FORENSIC RESEARCH PROJECT

RESEARCH PROJECT

Title	: Proximity ligation assay for biomarker analysis in fingermarks
Keywords	: Fingermarks, profiling information, proximity ligation assay, oligonucleotides, antibodies
Forensic Expertise Area	: Forensic biology, forensic chemistry
Department	: Biomedical Engineering & physics
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SHORT DESCRIPTION

Fingermarks are among the most important types of physical evidence that can be encountered at the crime scene, since their characteristic ridge pattern can be used for identification. Fingermarks are composed of materials derived from sweat excreted via the pores present in the skin, but can also contain contaminants originating from the environment. Thus, when depositing a fingermark, each individual will also leave a unique chemical profile that can be used to create a donor profile. Importantly, in case of a poor quality fingermark or when no reference fingerprint is present in the fingerprint database, this additional chemical information might give clues about the donor (e.g. sex, blood type, diet and drug usage) (1,2).

Since fingermarks are minimal samples, with biomarkers present in trace amounts, the aim is to develop an extremely sensitive and specific method, which involves the use of a proximity based ligation assay (PLA). In a PLA, matched antibody pairs are conjugated to 5' and 3' oligonucleotide probes. When both antibodies are in close proximity, connector oligonucleotides will hybridize to the free ends of their oligonucleotides and will be joined together by enzymatic DNA ligation, forming an amplifiable template for polymerase chain reaction (PCR). The amplification step enables the measurement of very few ligation products, meaning an extremely sensitive detection. The use of this dual recognition mechanism creates also a highly specific assay (3,4,5).

REQUIRED/RECOMMENDED EXPERTISE

We are looking for a master student with a biomedical- or chemistry background. Basic knowledge of immunogenic and PCR analysis is beneficial, but further training can be offered. Its required that the student can work with human material. The anticipated starting date is August/ September 2022.

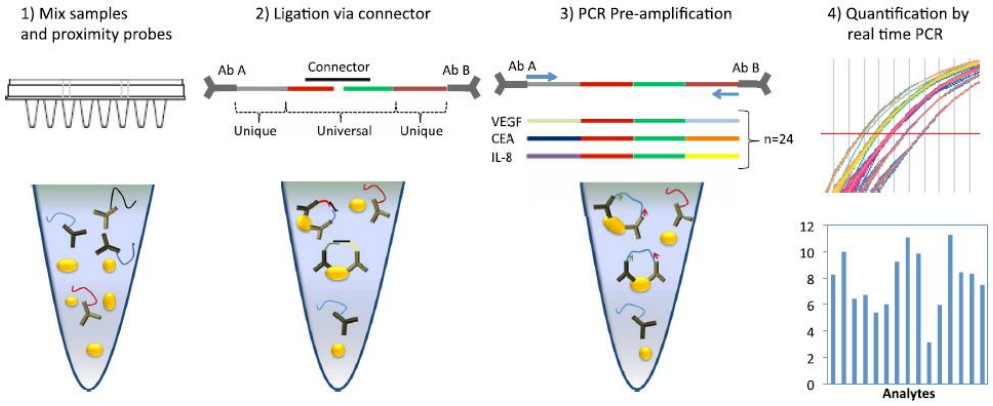


FIG. 1. **Schematic description of multiplex homogenous proximity ligation assay.** (1) The samples are incubated with 23 pairs of proximity probes in 1 μl sample. (2) Upon proximal binding of the pairs of PLA probes to a common antigen the oligonucleotide sequences are ligated using a connector oligonucleotide. (3) The ligated products are amplified in multiplex using all pre-amplification primers simultaneously. (4) This is followed by quantification of each biomarker by quantitative real time PCR using only the unique primer pair for a given analyte.

(6)

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