Detecting DNA Hybridization with Raman Spectroscopy

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DNA hybridization is a technique used in molecular biology to measure the degree of genetic similarity between DNA sequences. It involves the mixing of a known single-stranded probe DNA sequence with the sample DNA; followed by the denaturation of the sample DNA and the re-establishment of the hydrogen bonds (hybridization) with the probe strand. Successful hybridization means that the probe and sample strands are complementary, and it is a clear confirmation that the sequence in question is present in the sample DNA.

In most cases, hybridization is detected by well-known polymerase chain reactions and other techniques. Here we report on a Raman spectroscopy-based method in which the probe strand is labeled with an alkyne group and the hybridization is detected through the changes in the parameters of the alkyne Raman peak, occurring during the hydrogen bond formation. It was found that the variation of the peak parameters allows the distinction between the complete and imperfect hybridizations of the probe and sample DNA strands, and so the identification of mutations in the sample strand. Therefore, our method is capable of the detection of single-nucleotide polymorphisms (substitution of a single nucleotide at a specific position in the DNA sequence).

Acknowledgements: The work was supported by the EU H2020 FET-Open 712821 NEURAM project, and the NKFIH-468-3/2021 NAPLIFE, VEKOP-2.3.3-15-2016-00002 and TKP2021-NVA-04 grants of the National Research, Development and Innovation Office of Hungary.