Pre-PCR processing: Strategies to generate PCR-compatible samples

Polymerase chain reaction (PCR) is recognized as a rapid, sensitive, and specific molecular diagnostic tool for the analysis of nucleic acids. However, the sensitivity and kinetics of diagnostic PCR may be dramatically reduced when applied directly to biological samples, such as blood and feces, owing to PCR-inhibitory components. As a result, pre-PCR processing procedures have been developed to remove or reduce the effects of PCR inhibitors. Pre-PCR processing comprises all steps prior to the detection of PCR products, that is, sampling, sample preparation, and deoxyribonucleic acid (DNA) amplification. The aim of pre-PCR processing is to convert a complex biological sample with its target nucleic acids/cells into PCR-amplifiable samples by combining sample preparation and amplification conditions. Several different pre-PCR processing strategies are used: (1) optimization of the DNA amplification conditions by the use of alternative DNA polymerases and/or amplification facilitators, (2) optimization of the sample preparation method, (3) optimization of the sampling method, and (4) combinations of the different strategies. This review describes different pre-PCR processing strategies to circumvent PCR inhibition to allow accurate and precise DNA amplification.