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qPCR Method for Detection of Halal Food Adulteration

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Abstract : Nowadays, European producers are increasingly interested in the production of halal meat products. Halal meat has been increasingly appearing in the EU's market network and meat products from European producers are being exported to Islamic countries. Halal criteria are mainly related to the origin of muscle used in production, and also to the way products are obtained and processed. Although the EU has legislatively addressed the question of food authenticity, the circumstances of previous years when products with undeclared horse or poultry meat content appeared on EU markets raised the question of the effectiveness of control mechanisms. Replacement of expensive or not-available types of meat for low-priced meat has been on a global scale for a long time. Likewise, halal products may be contaminated (falsified) by pork or food components obtained from pigs. These components include collagen, offal, pork fat, mechanically separated pork, emulsifier, blood, dried blood, dried blood plasma, gelatin, and others. These substances can influence sensory properties of the meat products - color, aroma, flavor, consistency and texture or they are added for preservation and stabilization. Food manufacturers sometimes access these substances mainly due to their dense availability and low prices. However, the use of these substances is not always declared on the product packaging. Verification of the presence of declared ingredients, including the detection of undeclared ingredients, are among the basic control procedures for determining the authenticity of food. Molecular biology methods, based on DNA analysis, offer rapid and sensitive testing. The PCR method and its modification can be successfully used to identify animal species in single- and multi-ingredient raw and processed foods and qPCR is the first choice for food analysis. Like all PCR-based methods, it is simple to implement and its greatest advantage is the absence of post-PCR visualization by electrophoresis. qPCR allows detection of trace amounts of nucleic acids, and by comparing an unknown sample with a calibration curve, it can also provide information on the absolute quantity of individual components in the sample. Our study addresses a problem that is related to the fact that the molecular biological approach of most of the work associated with the identification and quantification of animal species is based on the construction of specific primers amplifying the selected section of the mitochondrial genome. In addition, the sections amplified in conventional PCR are relatively long (hundreds of bp) and unsuitable for use in qPCR, because in DNA fragmentation, amplification of long target sequences is quite limited. Our study focuses on finding a suitable genomic DNA target and optimizing qPCR to reduce variability and distortion of results, which is necessary for the correct interpretation of quantification results. In halal products, the impact of falsification of meat products by the addition of components derived from pigs is all the greater that it is not just about the economic aspect but above all about the religious and social aspect. This work was supported by the Ministry of Agriculture of the Czech Republic (QJ1530107).

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