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The Importance of Using Molecular Techniques in Controlling the Quality of Meat Products

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Meat products play a significant role in supplying protein in human nutrition. The industrialization of societies has led to an increase in the consumption of raw meat products, including hamburgers in countries, such as Iran. Due to some misuses by food manufacturers in producing these products, more attention should be paid to the ingredients of meat products. The quality control of these products is of particular importance. Therefore, one of the most important frauds in producing this group of meat products, which also causes health hazards, is the use of unauthorized edible tissues instead of meat in the formulation of meat products in the productive food industry [1-3].

In a significant number of hamburger samples manufactured industrially, there are unauthorized edible tissues instead of meat in the formulation of this product. It will endanger the consumer's health, reduce the national trust in such products, and, consequently, create economic problems and high costs for the treatment of the illnesses [2-3]. Therefore, identifying animal species in protein products consumed by human is very important in terms of economic, religious, and health issues [4-5]. Given the fact that the conventional methods of hamburger quality control cannot reveal this fraud, it is recommended to replace molecular tests which are highly sensitive and accurate with the conventional chemical and histopathology tests. Proper labeling especially in processed products, which seems difficult to detect a component from other components, as well as using molecular techniques are important steps to achieve community nutritional health [3-6, 7]. In general, the methods used to identify and analyze animal proteins in meat products include miscellaneous methods (sensory analysis, chemical methods, histological differences, fat tissue properties, glycogen levels in muscle tissue), protein based methods (microscopic, electrophoretic, chromatography, immunology), and molecular biology methods (DNA hybridization and PCR). Given the disadvantages

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and limitations of miscellaneous methods and protein-based methods, such as lack of specific performance, complexity and not affordable in terms of cost and time, the application of PCR technique has increased due to its simple, sensitive, and specific function [8-12].

For the first time, the Chikuni used the PCR method in 1994 to detect fraud in meat and meat products of domestic animals [13]. Today, DNA-based techniques have been able to prove their application in this regard. Polymerase chain reaction (PCR) is one of the most important DNA-based techniques. Various PCR-based methods, due to their specificity, accuracy, precision and speed, low process time, and low cost, have been useful tools for identifying raw materials in food sources. Mitochondria DNA is superior to genomic DNA due to its superiority for species diagnostic and fraud detection studies in industrial processed products [14].

Determining the frauds in meat products using the molecular science achievements can play a significant role in the quality control of food industries. In this method, a specific piece of DNA from the animal cell in the desired product is searched using specific primers. Finally, by determining the sequence of the indicator gene, the nature of the consumed meat in the mixture of minced meat will be detected. The method steps involved collecting meat samples, extracting DNA from the product, performing a polymerase chain reaction, and determining the sequence of the replicated gene. Generally, by using the gene database data all frauds of meat products can be detected [1-6,15]. Therefore, the PCR method can be used to determine and confirm the food compounds to protect both consumers and manufacturers against possible illegal fraud.

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