



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

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ARTICLE INFO

LETTER TO EDITOR

Article History:

Received: 31 August 2018

Accepted: 20 October 2018

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Citation: Hosseini SS, Shirdeli M. **The Importance of Using Molecular Techniques in Controlling the Quality of Meat Products.** *J Environ Health Sustain Dev.* 2018; 3(4): 618-20.

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 industry¹⁻³.

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 illnesses²⁻³.

Therefore, identifying animal species in protein products consumed by human is very important in terms of economic, religious, and health issues⁴⁻⁵. 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

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 function⁸⁻¹².

For the first time, the Chikuni used the PCR method in 1994 to detect fraud in meat and meat products of domestic animals¹³. 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 products¹⁴.

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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References

1. Amaral JS, Santos CG, Melo VS, et al. Identification of duck, partridge, pheasant, quail, chicken and turkey meats by species-specific PCR assays to assess the authenticity of traditional game meat Alheira sausages. *Food Control*. 2015; 47(1): 190–5.
2. Fernandes TJ, Amaral JS, Oliveira MB, et al. A survey on genetically modified maize in foods commercialised in Portugal. *Food Control*. 2014; 35(1):338-44.
3. Institute of Standards and Industrial Research of Iran. Row frozen hamburger–specifications. ISIRI no 2304. 3rd revision, Karaj: ISIRI; 2007 [In Persian].
4. Ghovvati S, Shahroudi FE, Mirhosseini SZ, et al. Fraud identification in fishmeal by 12s rRNA and 16s rRNA of mtDNA sequence. 5th National biotechnology conference. 2007.
5. Ghovvati S, Nassiri MR, Mirhoseini SZ, et al. Fraud identification in industrial meat products by multiplex PCR assay. *Food control*. 2009; 20(8): 696-9.
6. Abbasy-Fasarani M, Hosseini H, Jahed-Khaniki GR, et al. Histological study of industrial hamburgers containing 30 and 60 percent meat for presence of unpermitted edible tissues and correlation of this factor to meat connective tissue chemical indices. *Iranian Journal of Nutrition Sciences & Food Technology*. 2013; 7(5): 311-8.
7. Ballin NZ, Vogensen FK, Karlsson AH. Species determination–Can we detect and quantify meat adulteration? *Meat science*. 2009; 83(2):165-74.
8. Abd El-Nasser M, Labieb H Y, Abd El-Aziz D M. Detection of native and modified soybean in some meat products in Assiut city, Egypt. *Assiut University Bull Environ Research*, 2010; 13(1): 27-35.
9. Castro F, García MC, Rodríguez R, Rodríguez J, et al. Determination of soybean proteins in commercial heat-processed meat products prepared with chicken, beef or complex mixtures of meats from different species. *Food Chemistry*. 2007; 100(2):468-76.
10. Ilhak OI, Arslan A. Identification of meat species by polymerase chain reaction (PCR)

- technique. *Turkish Journal of Veterinary and Animal Sciences*. 2007; 31(3):159-63.
11. Nollet L. Detection of adulterations, in the safety analysis of foods of animal origin in: *Detection of adulteration*, (Editors: L. Nollet and F. Toldra). Belgium, 2011; 155-158.
 12. Renčová E, Tremlová B. ELISA for detection of soya proteins in meat products. *Acta Veterinaria Brno*. 2009; 78(4):667-71.
 13. Chikuni K, Tabata T, Kosugiyama M, et al. Polymerase chain reaction assay for detection of sheep and goat meats. *Meat Science*. 1994; 37(3):337-45.
 14. Bravi CM, Lirón JP, Mirol PM, et al. A simple method for domestic animal identification in Argentina using PCR-RFLP analysis of cytochrome b gene. *Legal Medicine*. 2004; 6(4):246-51.
 15. Devine C, Dikeman M. *Encyclopedia of meat sciences*. Elsevier; 2014; 265-9.