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The effect of common spices and meat type on the formation of heterocyclic amines and polycyclic aromatic hydrocarbons in deep-fried meatballs

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Abstract

Spices are commonly used as flavour enhancer and natural antioxidants in processed meat products. However, effect of spices on the formation of carcinogens especially heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) in different meat system has yet been investigated. In this study, 0.5% garlic, onion, red chilli, paprika, ginger and black pepper powder was added into beef and chicken meatballs fried at 180°C. Formation of HCAs and PAHs was examined to evaluate the inhibitory efficiency of spices in beef and chicken meatballs. Control meatballs (without adding spice) contained the highest amount of HCAs compared with all spice added meatballs of both beef and chicken. All the spices powder reduced the formation of total HCAs, while ginger powder achieved the highest inhibition efficiency compared with all other spices. The correlation coefficient (r) between antioxidant capacity of spices and total HCAs was - 0.853 ($p<0.01$) for TEAC and - 0.712 ($p<0.05$) for ORAC. Chicken meatballs contained less HCAs than beef, but no difference was observed in total PAHs between beef and chicken meatballs ($p>0.05$). Both electron transfer and hydrogen donation were involved with the inhibitory effect of spices for developing HCAs, but only electron transfer mainly in the formation of PAHs. In conclusion, antioxidant capacity of spices determined their efficiency in prohibiting formation of HCAs and PAHs, and meat type affected the formation of HCAs, but not PAHs.

Key words: Antioxidant capacity; Free radicals; Phenolic; Thermal stability.

Chemical compounds studied in this article