Evaluation of nitrosamine compounds in some foods

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Nitrates are present naturally in soil, water and plant materials as aconsequence of nitrogen fixation . In addition, the wide use of nitrogenbasedfertilizer in agriculture contributes to the total nitrate present in thesoil and water. Nitrate is therefore likely to be present in most things weeat or drink.The determination of nitrate and nitrite in foodstuffs has becomeincreasingly important because of concern over excessive human dietaryintake of these species. The toxicity of nitrite, especially in relation tonitrosamine production, has been well stablished. and whilest nitrate notvery toxic, their ready to conversion into nitrite means that levels of nitrate must be carfully monitored.Subsequently, this investigation was designed to demonstrate thefollowin points : * Effect of location of market on the nitrite, nitrate and nitrosamine compounds of some selected fresh vegetables, fruits, meat and meatproducts as well as some types of fish and baby foods. * Effect of storage conditions (at room temperature, refrigeration andfreezing) on N(h and NOJ levels of some vegetables.* Effect of cooking on N02 and N03 concentration of some selectedvegetables.* Effect of soaking in N~ and NOJ solutions with differentconcentrations for different time on the N~ and N03 residues of old andyoung beef meats. Effect of different cooking methods (boiling in water, frying and grilling) on the NCh and N03 residues of meats. * Evaluation of ascorbic acid and ec-tocopherol as inhibitors ofNnitrosamineformation in cured meats.The obtained results could be summarized as follow : 1. Nitrite2 nitrate and N-nitrosamine compounds in foods as affected bylocation of market: A. Data indicated that, leafy vegetables had the highest N03 content comparing with fruit vegetables, pulses and tuber vegetables.However, some root crops such as beet roots and radish rootscontained substantial levels of NOJ. Nitrite concentrations inmost vegetables under investigation are low of little concern,provided vegetables consumed within the normal shelf life. B. Soybean was found to contain a higher amounts ofN~ and N03 being 7.55 and 9.87 ppm, respectively compared with mung beansHowever, NDMA was only the nitrosamine compound detected inboth types of legumes, and mung beans was found to contain alevels (0.16 ppm) compared with soybean (0.54 ppm).C. Data indicated also that strawberry contained a higher levels ofN(h , N03 and NDEA compared with banana and orange.D. Five samples of baby foods were analyzed for N(h,N03 andN-nitrosamine compounds. Results showed that samples containrice had a higher concentrations of N02, N03 and NDMA followed by samples contained meats, wheat, vegetables andapples. E. Veal meat had the lowest levels of N~ compared with othertypes of meats. However, beefmeat contained higher concentrationsofN03, while Buffalo and Lamb meats were found to contain the lowest levels. The highest levels of total nitrosaminecompounds were observed in Veal meat (116.89ppm) followed by Lamb meat (88.00 ppm) and Buffalo meat (34.93 ppm). F. Luncheon meat had the highest levels ofNOz (112.78 ppm)followed by Bastirma (75.13 ppm), Sausage (34.45 ppm)and Frankfurter (22.26 ppm). While, the highest values of N03 were found in Bastirma (131.89 ppm) and the lowestlevels were in Frankfurters (12.29 ppm). On the othet hand,Bastirma had the highest levels of total N - nitrosaminecompounds (395.43 ppm), while Luncheon meat and Frankfurters were found to contain a moderate contents oftotal N-nitrosamine compounds.G. Data revealed that Karmout fish contained a higher NCh(3.49 ppm) followed by Bolti (2.44 ppm), Denis (2.09ppm)and Bayad (2.00 ppm) compared with other types offish.However, Macaroni, Baury , Denis , Bayad and Karmoutcontained a higher levels of N03 , it ranged

from(10.21 ppm) in Macaroni to (14.94 ppm) in Karmout. Dataindicated also the highest levels of total N-nitrosaminecompounds was observed in Macaroni fish (157.02 ppm) followed by Baury ~Bolti, and Sardin. Moreover ~the lowestlevels were found in Denis (0.48 ppm).H. Generally ~ the location of market makedly affect the NOl.,N03 and N-nitrosamine content in previous studied samples.2.Inhibition of nitrite and nitrate in vegetables : * Effect of Storage:The storage of fresh vegetables at room temperature, undercooling and frozen state reduced the nitrate and increased thenitrite contents of most vegetables under investigation.* Effect of cooking:Cooking process reduced the total NOl content between (8.07 %) in green beans to (99.50 %) in carrots. It could benoticed also NO] contents of raw vegetables reduced signi -ficantly in all tested vegetables as affected by cooking. Thegreatest reduction were found in leafy vegetables such as cabbage (77.64 %), spinach (90.04 %) and jew's mallow(94.76 %), followed by green beans (73.76 %), carrots (71.27 %), squash (62.54 %), potatoes (60.54 %), okra(52.78 %) and peas (33.32 %).3.Effect of soaking on the N02 and NO] residues in meats : Soaking of yuong and old beef meats in N02 and NO] solutions with different concentrations ranging from 50 to 500 ppm for 30 min and 24 hr caused an increases in N02 and N03 contents, 4. Inhibition of N~" NO) and N-nitrosamine compounds in cured meats : * Effect of cooking :The effect of different cooking methods (boiling in water, frying andgrilling) was carried out using the previous soaked samples in No" andNO) which contain a higher levels of NOz and NOJ . Data indicated thatNOz and NO), reduced with different levels as affected by cookingmethods. The higher reduction in NOz and NO] was noticed in old andyoung beef meats as affected by grilling * Effect of oc:-tocopheroland ascorbic acid : The obtained results indicated that the reduction rate of Nnitrosamine formation in dry and brine-cured beef and buffalo meatsincreased gradually as the levels of oc:-tocopherol or ascorbic acidincreased. The higher reduction was observed in buffalo meats than beefmeats. Moreover, ascorbic acid had a higher effect on the N-nitrosamineformation than oc:-tocopherol.* Effect of cooking on N-nitrosamin formation in oc-tocopherol andascorbic acid - treated meats:Samples of old and young meats (beef and buffalo) treated by octocopheroland ascorbic acid with different levels either in dry or brinecuring were cooked using different methods (boiling in water, frying andgrilling). Results showed that all different methods of cooking reducedNo" and N-nitrosamine formation with different levels and the reductionrate was higher in old meats than young meats. from the afformentioned results, it could be conclded that octocopheroland ascorbic acid could be used as an inhibitors of Nnitrosamineformationin cured meats. In view of the above mentioned results regarding the risk to human health posed by N-nitrosamine compounds it is prodent to attempt toreduce exposure. Examples of the ways in which this might be achievedare : * By reducing the use of N~ to minimumlevel necessary to preventgrowth of Clostridium botulinum.* Ensuring that the N02 is distributed as evenly as possible. * Avoiding the use of concentrated curing preparations in which N-nitrosamines can be formed before used. * Adding oc - tocopherol or ascorbic acid as an inhibitors of Nnitrosamine formation.