PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
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Pakistan Journal of Nutrition 2 (2): 98-101, 2003

Effect of Environmental Pollution on Quality of Meat in District Bagh, Azad Kashmir

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Abstract: The meat consumed by the people is sold in the open market and even on the roadsides. Special attention was focused on the determination of selected essential/heavy metals in meat samples. For assessing daily environmental contamination, sixteen meat samples of four varieties (Fish, beef, mutton and chicken) were purchased from local market and different spots of Nalahs (ravine). The samples were analyzed for the estimation of trace metals such as Pb, Cu, Ni, Zn along with Ca, Mg and Fe. The overall concentration of Pb, Ni, Zn and Mn were found small (0-4 ppm). Among major elements Fe was found quite high (600-7000 ppm). The Ca (600-2000 ppm) and Mg (800-1300 ppm) levels were also higher. Fe was recorded higher in beef and mutton, Ca in fish and mutton and Mg in mutton, chicken and fish were comparatively noted high.

Key words: Environmental pollution, trace metals, meat samples, major trace metals, slaughtering house

Introduction

The environmental pollution is a matter of great concern worldwide, and consequently contamination of food chain is getting increasingly important in view of its role in human health and nutrition. The rate of Urbanization and industrialization is increasing day by day in Kashmir. Besides many problems associated with such developments, the major one is the pollution. There are numerous types of environmental pollution, which constitute a potential danger to humanity (Khan *et al*., 1996).

Meat is a food material, which is composed of mainly proteins, fat and some important essential elements. Meat is essential for growth and maintenance of good health. Contamination is transferred to animals via direct exposure, polluted water and crops grown on irrigated sewerage water and industrial effluents. Another important reason for causing contamination of meat is the deposition of contaminants from vehicle emission and from the dirty slaughter places. It is necessary to establish ongoing knowledge of various pollutants in the meat. The shopkeepers sell most of the meat in the open market and even on road side. The contaminated food and water are sources of illness in human body. Among various pollutants in the environment, heavy metals are directly related to heath diseases in humans. Although it is difficult to classify trace metal into essential and toxic groups, yet it is well known fact that an essential metal becomes toxic at sufficiently high intakes (Khurshid and Qureshi, 1984).

Lead may enter the atmosphere during mining, smelting, refining, manufacturing processes and by the use of lead containing products. Lead intake occurs from the consumption of whisky, fruit juices, food stored in lead lined containers, cosmetics, cigarettes and motor vehicle exhaust (Benneth, 1981). Excess lead can cause serious damage to the brain, kidneys, nervous system and red blood cells. Young children, infants and fetuses are particularly vulnerable to lead poisoning. US environment protection agency (EPA) says that lead may be implicated in causing Leukemia (Anonymous, 2002). High concentration of copper oxide may result from welding operation. The corrosion of copper containing alloys in pipe fittings may add measurable amount of copper into the water. Copper content of normal human adult is 50-120 mg, but above 15 mg causes nausea, vomiting, diarrhea and intestinal pain. Copper deficiency results in anemia and the congenital inability to excrete copper resulting in accumulation and wilsons, S disease (Greenwood and Earnshaw, 1986). Environmental concentration of nickel is increased by nickel producing and processing industries. Vehicles exhaust a large quantity of nickel which is obtained from the petroleum. Cigarette smoking can increase the inhaled nickel to as much as 4 µg per pack of cigarette. Most of the Mn in the air is due to the burning of fossil fuels. When one is exposed to the higher level of Mn, it causes "Manganese psychosis" a mental disease characterized by uncontrolled laughter, euphoria, impulsiveness, sexual excitement followed by impotency. Zinc is essential for normal functioning of cells including protein synthesis, carbohydrate metabolism, cell growth and cell division (Saeed, 1998). However, if Zn concentration in air is over 15 mg/m^3, "metal fume fever" may result; which causes fever, depression, malaise, cough, vomiting, salivation and headache. Cadmium replaces Zn, in many enzymes. Therefore, a higher amount of Zn is required to overcome the toxic effects of Cadmium (Khan *et al*., 1990). Iron deficiency is seen in the premenopausal woman. In contrast to premenopausal women, adult

Table 1: Standard analytical conditions for AAS analysis

Element	Wavelength (nm)	HCl (mA) current	Types of Frame	Slit width (nm)	Sensitivity Check(ppm)	Fuel flow rate	Oxidant
Cu	324.7	15	Air acetylene	0.7	4	20 L/min	40 L /min
Ni	231.0	25	-do-	0.2	7	-do-	-do-
Pb	283.3	10	-do-	0.7	25	-do-	-do-
Mn	279.5	13	-do-	0.2	2.5	-do-	-do-
Zn	213.9	15	-do-	0.7	0.8	-do-	-do-

Table 2: For perkin-elmer instrument

Element	Wavelength (nm)	Sensitivity	Detection limits
Pb	283.3	0.45	0.03
Mn	285.2	0.008	0.0001
Zn	213.9	0.018	0.002
Ni	232.0	0.14	0.009
Cu	324.7	0.08	0.002

men should not use iron supplements, because high tissue level of iron correlate with increased risk of myocardial infarction (Harvey and Champe, 1994). High or low level of Mg causes serious problems including kidney failure and heart problems. High level of calcium is responsible for thirst, increased volume of urine, muscle fatigue, poor mental concentration and formation of kidney stones (Saeed, 1998).

Materials and Methods

Sample collection and preparation: Sixteen different samples of meat (Fish, beef, mutton and chicken) were collected from various shops of local market. Fish samples were collected from four different spots of Nala Maal and Nala Kain (ravines). All the meat samples were taken in the lab in plastic bags. For metal analysis wet digestion of meat samples was done using the method of Dell *et al.* (1972) modified by Sattar and Chaudary (1978) in a mixture of H_2SO_4, $HClO_4$ an HNO_3 in a ratio of 1:2:3, respectively.

Instrumentation: The Perkin-Elmer Atomic absorption spectrophotometer, model AA-2380 was employed in the analysis of samples. Hollow cathode lamps (Mito-Riko) were used. The instrumental conditions for the elements are given in Table 2 and 3. Air/acetylene were used as fuel (Table 1). During atomization the background was corrected. Three such determinations were taken for each sample and mean was taken as the observed value. The absorption signals of the samples were evaluated after subtracting the mean value of the blank.

Standards: Certified AAS stock standards of Pb, Cu, Ni, Zn and Mn containing 1000 mg/dm^3 were obtained from Canada for calibration curve. The standards were prepared by proper dilution of stock standard solution in 6N HCl.

Working standard solution: Pb, Ni, Cu, Zn and Mn standards containing 1-100 ppm were prepared from stock standard solutions.

Blank solution: Blank solutions were prepared and treated exactly in the same way as the samples except metal ion concentration. The absorption signals of sample solution were evaluated by subtracting the mean value of blank from the signals of the sample.

Results and Discussion

Environmental pollution is one of the most serious problems, which requires our urgent practical attention. Environmental pollution whether in solid, liquid or gaseous form is causing adverse effects on the behaviour and life of mankind and considerably damaging the animal and plant life. The primary sources of these pollutants are garbage's, trash, raw sewage, chemical effluents of the industries and emission of irritant and harmful gases from various sources. These pollutants emerge from rapid population growth, massive urbanization and extensive industrialization throughout the world (Raja *et al.*, 1996). Like many other countries, in Kashmir too, pollution is attributed to major urban and industrial centers along with poor methods of water disposal. The problem is serious because the whole chain of food production to consumption neither controlled nor regulated.

Effect of environmental pollution on food item has been a matter of great concern for both the developing and the industrialized countries. Azad jammu and Kashmir (AJK) is famous for meat consumption. Bagh is a newly born district. It has no doubt a big loud of newly settled population but the city is less industrialized. However, city is facing the loud of transportation especially the automobiles. Automobiles (cars, scooters, motorcycles) are the greatest source of air pollution. They produce nearly two thirds of carbon monoxide and one half of the hydrocarbons and nitrous oxide. The automobile exhaust also contain leaded gas and particulate lead. Automobile gasoline contains tetra-ethyl lead as knock inhibitor which is burned enters the atmosphere. Roadside plants contain high concentration of lead in their tissues and this has a sublethal effect on the health and longevity of animals. Traffic policemen and other who are exposed for long periods to heavy traffic have higher than average levels of lead in their blood.

Table 3: certified reference values

Name of standard	Type	Cu	Pb	Zn	Ni	Mn
BN	Liquid	2mg/L	<3mg/L	3mg/L	<2mg/L	10 mg/L
BM	Liquid	4mg/L	<3mg/L	<1mg/L	<2mg/L	5 mg/L

Table 4: Levels of heavy metals in fish samples (concentration in ppm)

Identity	Animal type	Physical state	Ca	Mg	Fe	Pb	Cu	Ni	Zn	Mn
F1	Fish	Whitish red	2000	1100	1500	<3	61	-	1	-
F2	Fish	-do-	2020	1125	1475	-	65	<1	<1	1
F3	Fish	-do-	1970	1080	1525	-	68	-	1	1
F4	Fish	-do-	2010	1095	1500	<3	66	-	-	-

Table 5: Level of heavy metals in beef samples (concentration in ppm)

Identity	Animal type	Physical state	Ca	Mg	Fe	Pb	Cu	Ni	Zn	Mn
B1	Beef(ox)	Solid red	720	755	2395	<3	25	1	1	3
B2	Beef(ox)	Solid red	650	800	2400	3	28	<1	2	2
B3	Beef(ox)	Solid red	720	815	2390	<3	30	-	<1	2
B4	Beef(ox)	Solid red	710	830	2415	-	29	1	1	1

Table 6: Levels of heavy metals in mutton samples (concentration in ppm)

Identity	Animal type	Physical state	Ca	Mg	Fe	Pb	Cu	Ni	Zn	Mn
M1	Mutton (Goat)	Solid Red	1850	1200	7010	<3	68	2	1	4
M2	Mutton	-do-	2100	1200	7015	-	70	1	1	3
M3	Mutton	-do-	2000	1185	7000	-	71	2	<1	3
M4	Mutton	-do-	2050	1215	6975	-	71	<1	-	4

Table 7: Level of heavy metals in chicken samples (concentration in ppm)

Identity	Animal type	Physical state	Ca	Mg	Fe	Pb	Cu	Ni	Zn	Mn
C1	Chicken	Whitish red	590	1300	585	<3	11	1	1	1
C2	Chicken	-do-	580	1310	605	3	12	1	-	<1
C3	Chicken	-do-	620	1300	600	3	13	1	1	<1
C4	Chicken	-do-	610	1290	610	-	12	1	1	1

Lead levels of 20-40 μg per 100 g of blood (0.2-0.4 ppm) are considered normal and harmless for city dwellers. But 0.8 ppm levels in adult humans causes over symptoms such as anemia, kidney disease and convulsions. However, in children 0.6 ppm level in blood may cause lead poisoning and ultimate death. Large scale use of Agriculture chemicals such as pesticides and herbicides ultimately find their way to pollute the area. our dependence on pesticides and herbicides have increased up to the extent that if the modern Agriculture will attempt to operate without chemical control of any sort, crop production will preferably decline in many areas, food prices will become very high and food shortage will become even more severe (Qayyum and Ashraf, 2001). Certain pesticides are found to have mutational effects on DNA molecules. DDT is found to be a carcinogenic in human tissue. Municipal sewage water also adds various types of pollutants which contaminate water and food stuffs. Due to traditional food habits, city population consume major quantity of pulses, wheat and rice particularly by middle and low income groups. Domestic sewage and waste-water is about 99.9% water and 0.02-0.04% solids of which proteins and carbohydrates each comprises 40-50% and fats 5-10% (Qayyum and Ashraf, 2001). In other words, sewage includes mostly biodegradable pollutants such as human faecal matter, animal wastes, and certain dissolved organic compounds and inorganic salts such as nitrates and phosphates of detergents and sodium, potassium, calcium and chloride ions. Under natural processes most of the biodegradable pollutants of sewage are rapidly decomposed, but, when they accumulate in large quantities, they create problems.

The present work was done for the estimation of trace metals in sixteen meat samples of four different varieties (fish, beef, mutton and chicken) Purchased from local market and from different spots of Nalahs. The atomic absorption spectrophotometer was used for the analysis of Pb, Cu, Ni, Zn, Mn, Ca, Mg and Fe. The overall concentrations of Pb, Ni, Zn and Mn were found small (0-4 ppm). However, concentration of Cu was found higher (11-71 ppm) in different samples. Among major elements Fe, was found quite high (585-7015 ppm),

while Ca (580-2100 ppm) and Mg (755-1310 ppm). Fe was recorded higher in beef and mutton. Similarly, Ca in fish and mutton and Mg in mutton, chicken and fish were comparatively noted high.

The data showed slight higher level of trace metals in beef and mutton. This may be due to the grazing of cattle on the contaminated soil. Cattle usually graze near the stagnant water in rural areas. While grazing in the contaminated areas the like hood of metal exposure is far more. Metals may also be added through food chain. Fodder crops, use of poultry diet and insecticides in the urban areas may also contain trace metals.

Generally contamination of meat depends on nature and age of animal, place of animal, dietary habits, slaughtering, transportation condition and exposure time to dust etc. However, proper covering of meat at shop can reduce up to 90% of contamination from open air. Further, through washing of meat also remove the deposited contamination to some extent.

Following recommendations may be useful for controlling contamination to some extent:

1. The places where the animals live must be clean and should be fed on pure food and water.
2. The slaughter places should be cleaned and washed daily.
3. The slaughtered meat must be covered with suitable cloth or paper at shop.
4. Fresh meat should be preferred and healthy animals must be slaughtered.
5. Washing before use can reduce superficially deposited contamination.
6. Making regulatory policy decision and enforcing safety laws can control contamination.
7. Awareness of public.

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