International Journal of ChemTech Research
CODEN (USA): IJCRGG ISSN: 0974-4290
Vol.9, No.03 pp 407-411, 2016

Some Heavy Metals Concentrations in Tumor Tissue

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Abstract: Study was amid to detect some trace elements in human tumor tissue, Manganese, cobalt, cadmium and Zink was measured in cancer and benign tissue using atomic absorption , result show that cancer tissue have higher concentration of cobalt and Zink than benign tissue, it were 156.7±6.5 and 205.79 µg\g respectively. Females had higher concentrations than males in cancer 2011.41±439.79, 114..54±0.05, 157.05±6.50 206.58±20.93 µg\gin Mn, Cd, Co and Zn respectively also in benign tissue Female 2373.37±703.56, 114.56±0.06, 154.50±29.4, 204.65±28.23 µg\g in the same minerals above.

Key words : trace elements, atomic absorption, tumors tissue.

Introduction

As a results of contamination in Iraqi environment which increased after wars and used different weapons, trace elements were increased in different sites; soil, water, food and air, thus present study was suggested to detection some trace elements in human tumors tissue. Different study in Iraqi environment improved increasing in minerals concentration in different site such as air, soil, river water and plants in another hands other studies suggested these minerals roles in carcinogenicity and cytotoxicity on human body. Taha *et al*., improved that the concentration of some minerals in the air of districts in Hilla city was abnormally high, also many local studies explained the high concentrations of these metals in the local environment (air, water and food)[1-4].

Cadmium (Cd) an known is one of toxic heavy metal that widely used in industry thus Cd is highly persistent in the environment, it effects on human health by occupational and environmental exposure. Cd exerts multiple toxic effects and has been classified as a human carcinogen by the International Agency for Research on Cancer (IARC). Cd is carcinogenesis that causes some cytotoxic effect by disruptiongene expression, inhibition of DNA repair systems , induction oxidative stress, and inhibition of apoptosis[5].

Cobalt (Co) is an essential trace element being an integral part of vitamin B12which is essential for folate and fatty acid metabolism. The carcinogenic potential of cobalt and its compounds was evaluated by IARC in 1991, which concluded that there was inadequate evidence for carcinogenicity in humans (lung cancer)[6].

There are two different mechanisms of cobalt genotoxicity, DNA breakage induced by cobalt metal, especially hard metal particles, and inhibition of DNA repair by cobalt (II) ions which contribute to the carcinogenic potential of cobalt compounds the experimental systems show index that soluble cobalt (II (cation sextend a genotoxic and carcinogenic activity in vitro and in vivo in but lacking in humans. Experimental data mention some arguments of cobalt metals genotoxic potential in vitro in human lymphocytes but there is no evidence available of a carcinogenic potential. The genotoxic and carcinogenic activity of cobalt particles in vitro and in human studies was be recorded but insufficient information for cobalt oxides and other compounds [7-13].

Zinc (Zn) is a trace mineral which is important for the functioning of some cellular activities , is contribute in growth, and play an important role in cancer causes and outcome , The levels of this mineral in cells are regulated by coordinated expression of zinc transporters proteins, which modulate both zinc influx as well as efflux. LIV-1ZIP6 proteins was first described in 1988 as an estrogen regulated gene with later work suggesting role for this transporter in cancer developments and metastasis[14]

Manganese (Mn) is one of the essential elements in living organisms and is naturally present environment .high level uptake of Mn by mouth or parenteral, or ambient air concentrations can causes increased Mn in tissue and neurological effects. However, current understanding of the impact of Mn exposure on the nervous system leads to the no adverse effects at low exposures, although Mn is an essential element in body but it mustn't be cross some threshold of its exposure because adverse effects can occur and increase in frequency with higher dose . little study found that Mn neuro toxicity include what the clinical significance is of the neurobehavioral, neuropsychological, or neurological end pointstested in many of the occupational studies that have detected groups exposed to low levels of Mn[15].

Mn toxicity has observed in occupational settings where there is the potential for chronic exposure to high levels or following the accidental ingestion of large quantities[16]

Materials and methods

Cancer tissue sample was obtained from AL-Hasanian the Lab which is detected by Dr. Liwaa Hussein Al-kilabi , 40 samples was used in this study 20 samples were cancer while the other 20 sample were benign, samples ware washing using DH2O more than one time then heavy metals determined in tissue as fallowing according to[17].

1. Pulled out the soft tissue from samples by plastic forceps and put in polyethylene dishes with removing the excessive water by filter paper.
2. Tissue dried on 70 C° for 24 hr. with well grinding by Ceramic mortar.
3. (0.3) g has been taken from dried grinded samples and put it on Teflon Beaker , then added 10 ml from.HNO3 with heating on 85 C° for 1hr . After that , few drops of hydrogen peroxide added for completion of oxidation process within temperature increasing up to 135 C° for 30 min. until we have a clear solution and left it for a while to get a cooling and complete by D.D.W up to 50 ml , and centrifuge this sample to remove suspended lipid compounds in case of presence for 10 min. at 2500 r.p.m and sample transferred to polyethylene bottle to be ready for measurement by Atomic Absorption Spectrophotometer type 6300(Shimadzu, Japan) and results expressed as μg/g. The Following equation was used to determine the concentration of heavy metals as μg/g.

Conc = AxBxd.f/D
conc. = Metal concentration in sample (μg/g dry weight)
A= Metal concentration from standard curve (mg/L)
B= Final volume for filterable samples (ml)
Df= Dilution factor and used as follow ;Df = Volume of dilution sample solution ml / Volume of aliquot taken for dilution in ml D= dry weight (g).

Results

Samples characterization in present study show that Age mean was 41.66 years, samples consist of high percentage of different cancer tissue it was 72.41% and 27.58 % was benign tissue. According to gender samples consist of 55.55% female and 44.44% male table (1).

Table (1) Characterization of tumor samples used in present study.

Character of sample	Percentage
Age	41.66±22.68
Benign	27.58%
Cancer	72.41%
Female	55.55%
Mal	44.44%

In cancer tissue trace elements concentrations were higher than its concentrations in benign tissue, these elements were Co and Zn, while others elements were lower in cancer tissue, all variation was non-significant, table (2).

Table (2) Trace elements concentrations inhuman tumor tissue in µg\g.

Trace elements	Mn	Cd	Co	Zn
Cancer tissue	1999.87±421.18	114.54±0.05	156.7±6.50	205.79±19.75
Benign tissue	2110.73±557.00	114.57±0.065	153.59±6.33	196.89±22.34

mean±SD

According to gender, in cancer tissue females had higher concentration of Mn, CO and Zn, same results was showed in benign tissue; Mn, Co and Zn concentration were higher than male table (3).

Table (3) Trace elements concentration Ppm in human according to gender µg\g

Trace elements		Mn	cd	co	Zn
Cancer tissue	Male	1998.14±413.59	114.54±0.05	156.44±6.71	204.9±18.98
	Female	2011.41±439.79	114..54±0.05	157.05±6.50	206.58±20.93
Benign tissue	Male	1848.1±212.08	114.57±0.073	152.68±9.093	189.14±14.40
	Female	2373.37±703.56	114.56±0.06	154.50±29.4	204.65±28.23

mean±SD

Discussion

The Genotoxic effects of metals can be mediated either through metabolically activated electrophilic derivatives that interact with DNA and other macromolecules, or through direct binding of DNA [12 (22)]. Many metals have been shown to directly modify and/or damage DNA by forming DNA adducts that induce chromosomal breaks[18,19]

Susceptibility to cancer is characterized by extensive DNA damage. This damage is thought to result from decreased repair capacity and/or by the direct carcinogenic interaction of metallic ions with DNA and DNA adducts[20]

Study show that even low doses and short term exposure to cadmium can cause specific DNA damage in breast tissue and may be a possible mechanism of action of cadmium on the cell cycle of human mammary cell lines[21]. Cadmium significantly stimulated the growth of MCF-7 cells when compared with cells grown in estrogen-depleted medium, comparable with the degree of growth stimulated by estradiol [21]. This study demonstrates that cadmium induces cell growth, and may have a possible role Since zinc is essential for growth and cancer is characterized by uncontrolled growth, zinc accumulation suggests an involvement of zinc in breast tumor genesis. Zinc is important to cell proliferation; however, it accumulates in mammary tumors and supports tumor growth [22-24].

In one study twenty-one-day old female rats were assigned to a low-zinc, an adequate-zinc, or ad libitum control groups. On day 50, all rats were injected with 1-methyl-1-nitrosourea (MNU) to induce mammary tumors. MNU has been widely used in rodent models to induce diverse mammary tumors that differ in type and location of formation in the mammary gland for studying human breast cancer due to their similarities in hormone dependency. The carcinogenicity of MNU is due to its ability to induce a mutation in the H-ras oncogene[25]. Results indicated low-zinc intake suppressed MNU-induced tumor incidence, tumor numbers and tumor multiplicity.

In Iraqi environment many studies improved increasing heavy metals in human body, in study on lactating mother's milk Ziadan et al (no published data)found that increasing in Mn, Co, Zn and Cd in mother's milk in Hilla city also Al-muhanna[26]. Found increasing in heavy metals Pb, Fe and Ni. In environment researchers found that Iraqi river air and soil was polluted by different heavy metals [27-29].this led us to concluded that increasing heavy metals in human especially in tumors tissue resulted from environment that may be responsible on carcinogenesis and cusses cancer.

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