

Levels of Trace Elements in Hydatid Cyst Fluid : Analytical Study

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Abstract :

The aim of the following study was to estimate the levels of trace elements in hydatid cyst fluid and evaluation the role of this elements on parasite life . trace elements in the fluid of hydatid cyst were detected by atomic absorption spectroscopy which found high ratio of Ca, K, Fe, Mg, Mn, Na, Cu, and Zn while P, Cr, Co, Cd, Pb, and Ni were low and include (8.71, 9.55 , 15.36, 5.91, 9.2 , and 11.3 \ μg) respectively .

Key words : Hydatid fluid , Trace elements, atomic absorption spectra

Introduction :

The disease of hydatid cyst is the proliferation of parasite in tissue by the different species of the genus *Echinococcus*, and represents a world health problem with important economic implications (King *et al.*, 2000). Hydatid disease is common with significant parasitic disease in endemic areas like Iraq. (Polat and Atamanalp , 2009). Hydatid cyst may develop in any organ of the human body, most frequently in the liver (60-70%) and the lungs (20-30%) (Bavbek *et al.*, 2000). The size , number and location of cyst are determine the symptoms in patients . it is still asymptomatic until the cysts become large enough to damage adjacent

tissues and organs, they are usually asymptomatic Clinical symptoms will not occur until the cyst ruptures because of trauma or affects neighboring structures. Secondary cyst or spillage of fluid from damage of hydatid cyst which is occur because of minor trauma, followed by an allergic reaction characterized by urticaria; more seriously, there may be an anaphylactic reaction (Polat and Atamanalp , 2009).

The aim of present study is to estimate the levels of trace elements in the fluid of hydatid cyst in patients with hydatidosis and to explain the role of these metals for the parasite life.

Materials & Methods :

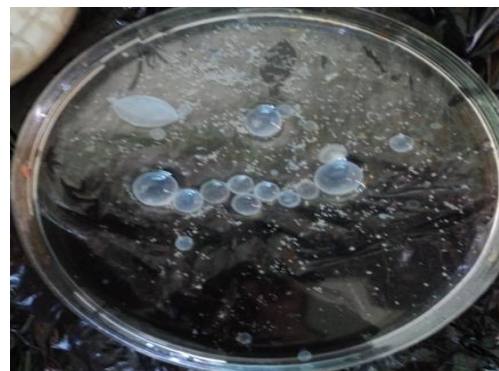
Fresh hydatid cyst were obtained from liver patients that were surgically removed in Al- Hussain Teaching Hospital in Nassiriyah city. They were wrapped carefully in clean plastic bags, placed in an ice box, and bring to the microbiology lab of medical college, where the fluid of hydatid cyst removed according to Smyth (1964) method .

Hydatid cyst fluids were collected by 5ml needle volume and provided to atomic

absorption examination . the fluid of hydatid cyst were mixed (0.5-3 ml) with in an equal volume of acid digestion mixture (perchloric acid and nitric acid) in 10 ml plastic tube. Shaking the sample enhanced the rate of digestion in one minute only. The digestion was completed in an oven at 37°C for 48 hours and finally a clear solution was formed which was diluted by 1:10 ml by deionized water and prepared for atomic absorption (Mehdi *et al.* 2010).



(A)



(B)

Hydatid cyst :(A) laminated layer (B) hydatid cyst fluid

Results and Discussion :

The essential components of biological structures of organisms is the organic metal or trace elements, but it may be toxic at concentrations beyond those necessary for their biological functions. This metal is effective at very low concentrations, and their concentration in the fluids must be tightly regulated, deficiency or excess both can killed the organisms (De Olivier *etal.*, 2001 and Shaeffer, 2006).

The following study investigates high levels of this material in the fluid of hydatid cyst of patients with hydatidosis . trace elements in the fluid of hydatid cyst included Cd , Ni, Na, Ca, Cu , Fe , Mg, Mn , Co, Cr, Pb , Zn , K and P .

Ca , Fe , Mg , Cu , Na, Zn , Mn and K were recorded in a high levels within the basic component of the fluid of hydatid cyst while Cd , Ni , Co, Cr, Pb

and P were found in low concentration when compared with the previous one .

The following table explain the concentration of the main minerals that consist a part of the fluids of hydatid cyst where Fe has 95.35 , Zn (86.56 \ μg), Cu(60.77 \ μg) , Ca (70.21 \ μg) , Mg (61.4 \ μg), Mn (29.82 \ μg), K(36.82\ μg) and Na(49.22\ μg) while Co, Cr, Pb, P, Cd , and Ni were reported (15.36 , 9.55, 9.2 , 8.71, 5.91, and 1.3 \ μg) respectively.

Trace elements have biological activities strongly associated with the biological systems; proteins are mostly bound to these metals , forming metalloproteins. They are consist part of enzymatic systems as metalloproteins , have structural and storage functions, or join to the protein to be transported to their target site in the organism (Srivastav *et al.*2011).

The Fe content in fluid of hydatid cyst is higher than the other trace elements and similar to that result found in content of *Fasciolopsis buski* body which is achieved by Srivastav *et al.*(2011) . Iron is an important element which takes part in biochemical processes acting as catalyst or cofactors because iron was found as inorganic deposits in the intestinal cells of many helminthes (Fraga ,2005) .

Hydatid cyst fluids were also contain Zn in high level . The highest value of Zn consist the basic contents in several parasites e.g. *Fasciolopsis buski* , *Fischoederius elongatus*, *Gastrodiscoides hominis*, *Fischoederius cobboldi*, *Gastrothylax crumenifer*, and *Orthocoelium orthocoelium* . Zinc is required for the started of DNA and protein synthesis, within the cell (Fraga ,2005). The

availability of Zinc within nucleolus leads to increase mRNA synthesis and this in turn causes increased availability of enzymes for DNA synthesis or transcription of DNA into RNA (Fraga ,2005 and Srivastav *et al.*2011) .

Ca , K, Na and Cu likes Fe and Zn showed high values in fluids of hydatid cyst which are needed for the development of connective tissue, nerve coverings, and bone. Ca ,K, Na, and Cu acts as a reductant in the enzymes superoxide dismutase, cytochrome oxidase, lysil oxidase, dopamine hydroxylase, and several other oxidases that reduce molecular oxygen (Aggett, 1994 and Ozen *etal.*, 2009). The same results were also found in *Fischoederius cobboldi*, *Gastrothylax crumenifer*, and *Orthocoelium orthocoelium* parasites but lowest in *Fischoederius elongatus*, *Gastrodiscoides hominis* (Srivastav *etal.*2011) .

all forms of life required Manganese and Magnesium as an essential trace nutrient and the best known manganese-containing polypeptides may be arginase, the diphtheria toxin, and Mn-containing superoxide dismutase (Mn-SOD) . Mn which is essential in the synthesis of glycoproteins, polysaccharides and sterol . The higher amounts of Mg suggests that it is essential for “Intercellular ionic bridging” changes at the cell surface and shape of the cell during cleavage (Tandon and Ray , 1994) and (Ozen *et al.*, 2009).

In Comparison with the previous elements ; Ni , Co, Cr, Pb, P, and Cd

were lowest which have been found in poor amounts in the fluid of hydatid cyst and similar to that found in some trematoda. Chromium is important for the structure and metabolism of nucleic acids and deficiency leads to several dysfunctions . Ni can influence the activity of numerous enzymes *in vitro*, An enzymes have been estimated to be activated or inhibited by Ni. Cd and Pb are more important on the body's organ systems, like the nervous system, but also the bones, the kidneys, and the cardiovascular, immune, and

reproductive systems . Presence of Cd in small amounts in the fluid of hydatid cyst and among all the flukes : *Fasciolopsis buski* , *Fischoederius elongatus*, *Gastrodiscoides hominis*, *Fischoederius cobboldi*, *Gastrothylax crumenifer*, and *Orthocoelium orthocoelium*, is known to be very toxic to man as it accumulates in kidneys and also affects the reproductive organs (Tandon and Ray , 1994 ; De Olivier *et al.*, 2001 and Srivastav *et al.*,2011) .

Table (1) :
The Pure Concentration of Trace elements of Hydatid Cyst Fluids

Trace element	Concentration in hydatid cyst fluid (µg)
Zn	86.56
Cu	60.77
Fe	95.35
Ca	70.21
Mg	61.4
Mn	29.82
Co	15.36
Cr	9.55
Pb	9.2
P	8.71
Cd	5.91
K	36.82
Na	49.22
Ni	1.3

Conclusions :

- 1- Many type of trace elements were found in hydatid cyst .
- 2- Trace elements consist basic content in parasite life.

Recommendations :

- 1- Detection of trace elements in sera of patients.
- 2- Explain the effect of decrease or increase trace elements levels in sera of patients.

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مستويات العناصر النزرة في سائل الكيس العدري : دراسة تحليلية

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الخلاصة :

تهدف الدراسة الحالية الى تقدير مستوى العناصر النزرة في سائل الكيس العدري وتوضيح دورها في حياة ووجود الطفيلي وذلك من خلال الكشف باستخدام جهاز طيف الامتصاص الذري والتي وجدت نسبة عالية من العناصر النزرة ضمن سائل الكيس العدري مثل الكالسيوم والبوتاسيوم والحديد والمغنسيوم والمنغنيز والصوديوم والنحاس والزنك بينما سجل كل من الفوسفور والكروم والكوبلت والكاديوم والفوسفات والنيكل نسبة اقل والتي كانت (8.71 , 9.55 , 15.36 , 5.91 , 9.2 و 11.3) على التوالي .