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Quantitative Analysis of Trace Elements In *Fasciolopsis buski* and *Gastrodiscoides hominis*

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ABSTRACT

Distribution of trace elements viz. Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, and Zn were evaluvated quantitatively in *Fasciolopsis buski* and *Gastrodiscoides hominis* by the use of Atomic absorption spectrophotometry. The results showed minor variation in the distribution of these trace elements in the above mentioned parasites. Trace elements viz. Mg, Cu, Fe and Zn were found in higher amount in *Fasciolopsis buski* and *Gastrodiscoides hominis* whereas Cr, Mn, Ni were observed in the minor amount in both the parasites. The results also indicated the presence of heavy and highly toxic elements viz. Cd and Pb in minute amount in both the parasites. The aim of this paper is to investigate about trace elements, their biological functions and assessment of their status in *Fasciolopsis buski* and *Gastrodiscoides hominis.*

Key words: Trace, Physiology, Toxic, Essential, *F. buski*, *G. homonis.*

INTRODUCTION

Fasciolopsis buski is a common parasite of pigs and humans which causes Fasciolopsiasis and it is most prevalent in Asia, mainly central and south-east Asia. The reason for its common name is due to the fact that it is one of the largest flukes to infect humans. The worm inhabits the upper region of the small intestine and when abundant can also be found in the lower areas of the intestine and the stomach [1]. Gastrodiscoidiasis is an infection that is usually asymptomatic and affects the small intestine and is caused by a trematode (fluke) named *Gastrodiscoides hominis*. *Gastroiscoides hominis* is usually found in India, Southeast

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Asia, and China in Pigs genrally, but when it infects humans can cause serious health problems and even mortality [2].

Trace elements which are not synthesized in animal tissues but have been found to play significant role in a number of essential metabolic functions viz. Growth and reproduction (Zn, Se), immune functions (Zn, Se, Fe), lean body mass (Cr), bone density (Cu, Zn, Cr), cognitive functions (Zn, Se), insulin sensitivity (Cr) and oxidative stress (Zn, Se, Cu, Fe). Antioxidant trace elements (Zn, Se, and Cu) are involved in cellular antioxidant defenses and protection against accelerated aging processes [3, 4]. The exact distribution of these trace elements is not very clear or concentrations still remain unknown in large number of parasitic helminthes [5]. Ma L. (1963) reported Na, K, Ca, Mg, Fe, Si, Cu, Mn, Zn, Pb, Mo, and P, quantitatively and Si, Li, B, As, Cd, Sb, Sn and Co, qualititatively in *Clonorchis sinensis* by colorimetry and emission spectrography [6]. Goil M. M. (1964) reported large amount of phosphorus and small amounts of Ca and Mg by quantitative analysis in four trematode parasites viz. *Gastrothylax crumenifer*, *Cotylophoron cotylophorum*, *Paramphistomum explanatum* and *Fasciola gigantica* from Indian buffaloes [7]. Lal and Kumar (1985) found S, N, P Cl, K, Na, Mg, Ca, Fe, Zn, Cu, and Co in five nematodes namely *Haemonchus contortus*, *Trichuris ovis*, *Oesophagostomum columbianum*, *Bunostomum trigonocephalum* and *Seteria cervi* [8].

Goldsmid J. L. (1986) reported presence of Zn, Fe, P, Ca, Cu, Mg, Mn, and K in *Ternidens deminutus* from human and Baboon hosts [9], Gabrashanska and Damyanova (1987) found Se, Mo, Ca, Zn, Cr, K, Fe, Co, Cd, and Na, in *Fasciola hepatica*, *Moniezia expansa*, *Ascaridia galli*, and *Paramphistomum* spp. [10]. Pandey and Chowdhury (1989) reported Na, K, Cu, Mg, Ca, Zn, Fe, N, P, S, Cl Co, in male and female specimens of a nematode *Ascaridia galli* [11]. Chowdhury and Singh (1993) reported distribution of some trace elements like Cu, Co, Zn in hydatid cysts of *Echinococus granulosus* from buffalo [12]. Tandon and Roy (1994) found trace elements viz; Cu, Ca, Mg, Mn, Pb, Fe, Ni, Zn, Cr, Cd, K, Se, and Co in same edible trematode parasites namely *Gastrothylax crumenifer*, *Fischoederius elangatus*, *F. Cobboldi*, *Calicophoron calicophorum*, *Orthocoelium orthocoelium* and *Paramphistomum epiclitum* [13]. The aim of present study is to investigate the levels of trace elements in these edible trematodes and to explore their relation with their respective nutritional metabolism. The study will be also helpful to decide whether these parasites are beneficial or hazardous agents for the human health.

MATERIALS & METHODS:

Collection of parasites: Live parasites namely *Fasciolopsis buski* and *Gastrodiscoides hominis* were recovered from the intestine of pigs slaughtered at local abattoirs, Banglabazar Lucknow.

Preparation of Ash: The mature parasites of *F. buski* and *G. hominis* were washed thoroughly in Triple distilled water (TDW) and dried at $100^{0C} \pm 5^{0C}$ for 24 hours in an hot air oven. The dried material was grounded and 0.5 gm of ash from each samples was digested in 5ml of 2N HNO_3 for 12 hour followed by evaporation of the acid at $50^{0C} \pm 2^{0C}$.

Measurement of trace elements: About 2 ml of Perchloric acid was then added to the dried sample and final volume made to 50 ml. Cu, Mg, Ca, Mn, Pb, Fe, Ni, Zn, Cr, Cd, and Co was estimated by Atomic absorption spectrophotometer [14]. Trace elements were expressed as µg per gram of dry ash and values are mean ± SD of five samples in duplicate.

Table 1: **Dry weight persentage in tissue sample of *Fasciolopsis buski* (Lankester, 1857) and *Gastrodiscoides hominis (Lewis* & Mc Connell, 1876).**

Sample No.	*F. buski*	*G. hominis*
1.	11	11
2.	12	11. 5
3.	11. 8	11. 8
4.	11. 3	12
5.	12. 5	10.5

Dry weight percentage in tissue samples was calculated with respect to initial wet weight.

RESULTS AND DISCUSSION:

Microelements include a wide number of compounds with physiological activity and important health benefits. Dry weight percentage in tissue samples was calculated with respect to initial wet weight and Ash was finally used to analyse trace elements with the use of Atomic absorbtion spectrophotometry (Table 1). The results of the present study reveals that Mg, Cu, Fe, and Zn were found in large amounts in *Fasciolopsis buski* and *Gastrodiscoides hominis* whereas Cr, Mn, Ni, were found comparatively low (Table 2). The biological activities of Cu, Fe, and Zn are strongly associated with the biological systems; these metals are mostly bound to proteins, forming metalloproteins. Many of the metals in

metalloproteins are part of enzymatic systems, have structural and storage functions, or join to the protein to be transported to their target site in the organism [15]. The highest value of Cu, Fe, Mg, and Zn has been reported in several trematodes e.g. *Fischoederius elongatus*, *Fischoederius cobboldi*, *Paramphistomum epiclitum*, *Calicophoron calicophorum*, *Gastrothylax crumenifer*, and *Orthocoelium orthocoelium* [13].

Table 2: Trace elements content in *Fasciolopsis buski* and *Gastrodiscoides hominis*

Trace elements	***Fasciolopsis buski***	***Gastrodiscoides hominis***
Cd	5.50±1.25	1.25±0.20
Cr	3.75±0.75	8.50±2.25
Cu	71.10±8.50	45.70±5.60
Fe	216.25±22.50	59.10±5.12
Mg	175.50±12.50	263.50±20.20
Mn	13.40±1.75	17.75±2.50
Ni	5.50±0.50	28.80±5.50
Pb	1.51±0.10	5.20±1.20
Zn	180.50±15.50	195.20±20.25

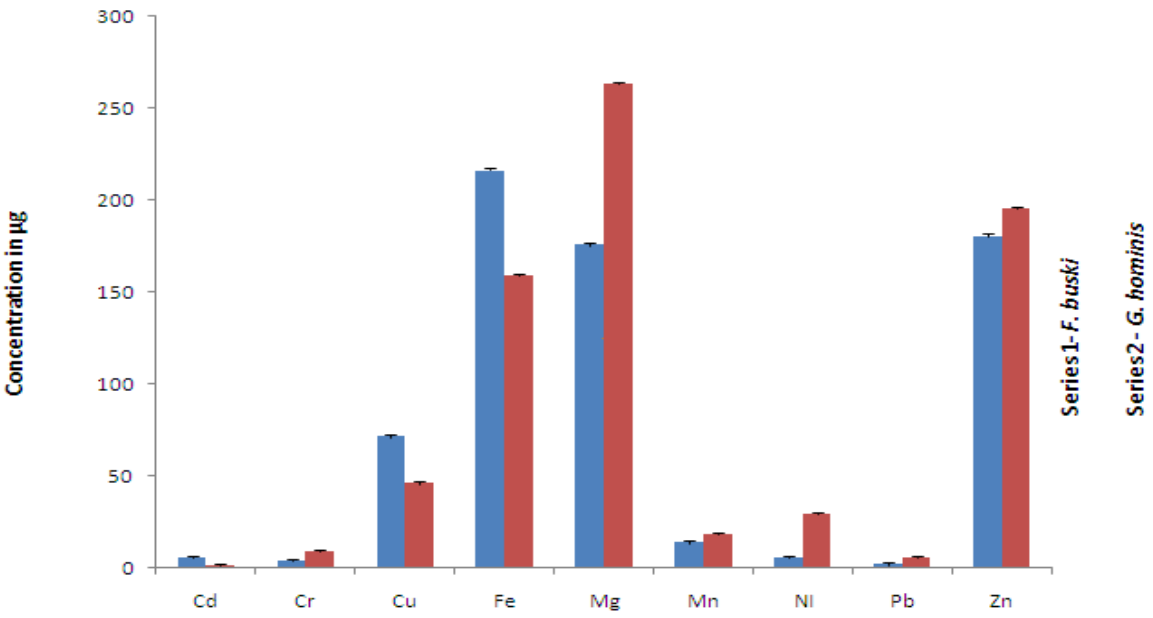
Units are expressed as µg per gram of dry weight.

Zinc is required for the initiation of DNA and protein synthesis, within the cell [16]. The availability of Zinc within nucleolus leads to be increased mRNA synthesis and this in turn causes increased availability of enzymes for DNA synthesis or transcription of DNA into RNA [17]. The presence of 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 [18]. The Fe content in *Fasciolopsis buski* is higher than that of *Gastrodiscoides hominis*, which was also found more than other trace elements, because iron was found as inorganic deposits in the intestinal cells of many helminths [19]. Iron is also an important element which takes part in wide variety of biochemical processes acting as catalyst or cofactors [20]. Cu is necessary for the development of connective tissue, nerve coverings, and bone. Cu acts as a reductant in the enzymes superoxide dismutase, cytochrome oxidase, lysil oxidase, dopamine hydroxylase,
and several other oxidases that reduce molecular oxygen.

Cr, Ni and Mn have been found in poor amounts in *Fasciolopsis buski* and *Gastrodiscoides hominis*. Chromium is important for the structure and metabolism of nucleic acids and difficiency leads to several dysfunctions [21]. Mn which is essential in the synthesis of glycoproteins, polysaccharides and sterol [22]. Ni can influence the activity of numerous enzymes *in vitro*, A number of enzymes have beenreported to be activated or inhibited by Ni [23]. Manganese is an essential trace nutrient in all forms of life and the best known manganese-containing polypeptides may be arginase, the diphtheria toxin, and Mn-containing superoxide dismutase (Mn-SOD) [24].

Cd and Pb was found in *Fasciolopsis buski* and *Gastrodiscoides hominis* in small amounts (Table 2). Inhaling cadmium-laden dust quickly leads to impairment in respiratory tract and kidney, which can be fatal [25]. Presence of Cd in small amounts among all the flukes studied, is known to be very toxic to man as it accumulates in kidneys and also affects the reproductive organs. Lead affects every one of the body's organ systems, especially the nervous system, but also the bones and teeth, the kidneys, and the cardiovascular, immune, and reproductive systems [26].

Fig. 1: Trace elements content in *Fasciolopsis buski* and *Gastrodiscoides hominis*



It may be concluded that the difference in the quantity of various trace elements in these two parasites i e. *Gastrodiscoides hominis* and *Fasciolopsis buski*, may be due to their different habitats (Fig. 1). It also depends upon availabilities and deficiencies in the host diet [27].

Moreover it also depends upon the individual make-up of the proteins and nucleic acids present in the parasites, which differs from species to species dietary preference of the parasites and nature of feeding. The authors have detected Mg, Ni, Cr, and Pb in *Fasciolopsis buski*, and Cd, Cr, Ni, Mg, and Mn in *Gastrodiscoides hominis* for the first time. The higher content of Cu, Fe, Mg, and Zn in *Fasciolopsis buski* and *Gastrodiscoides hominis* reflects their importance and increased level of related metabolism in these parasites. The presence of Cd and Pb in *Fasciolopsis buski* and *Gastrodiscoides hominis* in small amounts reflects the toxicity and indicates their hazards nature as a supplement. Trace elements are essential components of biological structures, but at the same time they can be toxic at concentrations beyond those necessary for their biological functions.

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