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Artifical Intelligence Doctor (Aid) Using Big Data Analytics and Artificial Intelligence Techniques

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Abstract

This paper present the theoretical aspect of inventing a new device which is called as an Artificial intelligence doctor (AID) is a Automatic medical device is a self dectection diseseases machine to identify the trace element & recognising the diseases and advising the patients to be aware of their health. A trace element is an element (e.g., lead, selenium, arsenic) that is present in a human body and it is very small, making it a challenge to measure them accurately. This research focus is on trace elements that are in the human body and the proposed to devise (now in theoretical aspect) a new medical device to identify all the trace elements in the human body and recognising the diseases and checking the health of the people because they are essential for proper growth. All essential elements are for human nutrition. . It can be helpful to cure many diseases in future at home itself. The death ratio can also be reduced and human can live longer. The people can check their daily nutrition using this one.

Keywords: Elements, diseases ,level

INTRODUCTION TO THE MEDICAL DEVICE AID

This proposed kit or device will check the components or the elements in a body of a human being or any other creatures (animals) and provide the description of medicines to take. There is no need of doctor in future if this kit is designed. Generally human body contains lot of chemical element, gaseous elements. When these chemical level increases or decreases there is a chance for diseases. These has to be checked periodically and if there is any changes occur then this kit will advice the person to take the specific food or medicine. The people need not to go to hospital and consult a doctor. By regularly checking with this device it will alert them to take proper food. A man can live happily without caring about the diseases. The computer concepts such as Artificial intelligence and data mining techniques to be adopted to know the patients symptoms and can make decision according to them to provide medicines. Any kind of disease can be found by using this device and regulates the body function normally.

All human body is made up of elements and should be available at correct proportion to be healthy without any diseases. Their percentage in the body varies from one person to another person. If the percentage is increases or decreases then there is a chance of many diseases in the body. This proposed device will find a measurement of each element in the body and it display the symptoms, diseases, prescriptions and also advice to take the necessary food. This is the boon to the people in future and this device can be carried out by a person easily and can check it by the people itself. In future there is no need of doctor if this device is successful This paper need the information of trace element information to devise a AID.

INTRODUCTION TO ELEMENTS AND THEIR LEVEL IN HUMAN BODY

The Estimation is 98% of the body mass of man is made up of nine non metallic elements. The four main are sodium, magnesium, potassium, and calcium constitute about 1.89%, while the rest 0.02% or 8.6 g of an average human adults is made up of 11 typical trace elements. However, this tiny fraction exerts a tremendous influence on all body functions. Most of them mediate vital biochemical reactions by acting as a cofactor or catalyst for many enzymes. They also act as the center of building stabilizing structures such as enzymes and proteins. The accumulation of metals or deficiency of these elements may produce diseases. The following are the observed elements previously in the body and diseases identified practically.

STUDY OF TRACE ELEMENTS

To make this proposed device, a study about the trace elements in the body and their correct proportion in the body to be calculated. Then the measurement of each element of the healthy people is to be taken. The Symptoms and measurement of elements of patient has to be stored in a database. This can be taken from the information already available.

ESSENTIAL ELEMENTS FOR HUMAN BODY

The Four organic basic elements: H, C, N, O

Quantity elements - Na, Mg, K, Ca, P, S, Cl.

- Essential trace elements - Mn , Fe, Co, Ni, Cu, Zn, Mo, Se, I.
- Function suggested from active handling in humans, but no specific identified biochemical functions - Li, V, Cr, B, F, Si, As.

Biological classification

1. Essential trace elements: Boron, cobalt, copper, iodine, iron, manganese, molybdenum, and zinc.
2. Probable essential trace elements: Chromium, fluorine, nickel, selenium, and vanadium.
3. Physically promoting trace elements: Bromine, lithium, silicon, tin, and titanium.

Categorical Classification of Trace Elements

It is observed that there are at least 29 different types of elements including metal and non metals in an adult human body. These 29 elements can be broadly classified into five major groups they are as follows:

1. Group I: These elements are the basic components of macromolecules such as carbohydrates, proteins, and lipids. The elements belonging to these groups are carbon, hydrogen, oxygen, and nitrogen.
2. Group II: These are nutritionally important minerals. They are also called as principal elements or macro elements. Their daily requirement for an adult human is above 100 mg/day. The deficiency of such elements usually proves fatal unless intervened properly. The elements belonging to this group are sodium, potassium, chloride, calcium, phosphorous, magnesium, sulfur.
3. Group III: There are the essential trace elements. An element is called as trace elements when their requirement per day is below 100 mg and deficiency leads to disorders and may prove fatal. The elements belonging to this group are copper, iron, zinc, chromium, cobalt, iodine, molybdenum, and selenium. Of these, iodine is a non metal, while others are metals.
4. Group IV: They are additional trace elements. Their role is not clear and they may be essential. The elements belonging to this group are cadmium, nickel, silica, tin, vanadium, and aluminium.
5. Group V: This group of metals is not essential their presence may produce toxicity. They have no known function in the human body. The elements belonging to this group are gold, mercury, cyanide, and lead.

THE TRACE ELEMENT AND THEIR LEVEL AND SYMPTOMS OF DISEASES

Copper plays a very important role in our metabolism it allows many critical enzymes to function properly. Acidic conditions promotes the solubility which incorporates copper ions either in cupric form or cuprous form into the food chain. Copper toxicosis in plants is very rare compared to its deficiency while in animals and man toxicosis is usually induced by environmental concentrations in genetically abnormal individual. Mainly copper is available in the liver, shellfish, dried fruit, milk and milk products, sunflower seeds, oysters, sesame seeds, tahini, and sun dried tomatoes. The average content of metal in the plant usually ranges from 4 to 20 mg of copper per kg of dry weight. The average adult human of 70 kg weight contains about 100 mg. The daily requirement is about 2-5 mg of which 50% is absorbed from the gastrointestinal tract (GIT). Rest is excreted via bile and kidney. Copper accumulates in the liver, brain and kidney more than rest of body.

In human blood, copper is principally distributed between the erythrocytes and in the plasma. In erythrocytes, 60% of copper occurs as the copper-zinc metalloenzyme superoxide dismutase, the remaining 40% is loosely bound to other proteins and amino acids. Total erythrocytes copper in normal human is around 0.9-1.0 pg/ml of packed red cells. Copper has a selected biochemical function in hemoglobin (Hb) synthesis, connective tissue metabolism, and bone development. Synthesis of tryptophan is done in the presence of Cu. Besides these Cu as ceruloplasmin aid in the transport of iron to cells.

Diseases

A deficiency of Cu in diet for prolonged period especially during stages of active growth leads to anemia, growth retardation, defective keratinization and pigmentation of hair, hypothermia, mental retardation, changes in skeletal system, and degenerative changes in aortic elastin. Excessive Cu either or because they are toxic The deficiency when prolonged will be fatal. When iron is increased in body acutely, nausea, vomiting, diarrhea occurs along with hepatic damage. While chronic or prolonged accumulation of iron in body occurs there is a hepatic failure, diabetes, testicular atrophy, arthritis, cardiomyopathy, peripheral neuropathy, and hyperpigmentation. Bronze diabetes is a triad of hemochromatosis, diabetes, and cirrhosis. leukoplakia, there is a significant decrease in Hb and serum iron, whereas in oral submucous fibrosis the total iron binding capacity showed statistically significant changes. Recently, it has been found that iron may play a role in esophageal carcinogenesis.

Zinc (Zn)

The metal zinc is an ionized either in acidic or alkaline forms. Content of zinc is 2-3 ng the average body content of zinc is 2-

3 g in an average adult. About 99% is intracellular while the rest is in plasma. The average daily requirement is 15-20 mg/day. Phytase decreases fibers, phosphates, calcium, and copper competes with zinc for absorption from small intestine. About 2-5 mg/day is excreted via pancreas and intestine. The other mode of excretion is via proximal tubule and sweat glands.

Plasma zinc levels are decreased in pregnancy, fluid loss, oral contraceptive usage, blood loss, acute myocardial infarction, infections, and malignancies. The function of zinc in cells and tissues is dependent on metalloproteinase and these enzymes are associated with reproductive, neurological, immune, dermatological systems, and GIT. It is essential for normal spermatogenesis and maturation, genomic integrity of sperm, for normal organogenesis, proper functioning of neurotransmitters, proper development of thymus, proper epithelialization in wound healing, taste sensation, and secretion of pancreas and gastric enzymes. They can be biochemically classified as those involved in nucleic acid and protein synthesis and degradation, alcohol metabolism, carbohydrate, lipid, and protein metabolism. They include transferases, hydrases, lyses, isomerizes oxidoreductases, and transcription factors. The enzyme most essential for zinc are alkaline phosphates, alcohol dehydrogenase, carboanhydrase, glutamate and lactase dehydrogenase, and RNA polymerases. The deficiency symptoms include compromised energy metabolism, alcohol intoxication, acidosis, blockage of protein biosynthesis, transmutation reaction blocked cell destruction by superoxide radicals. Zinc plays an important role in cell proliferation, differentiation and metabolic activity of the cell.

Chromium (Cr)

The total content of chromium is about 0.006 g in an average human adult. The daily requirement is about 0.005 mg/day. The need of chromium is for biosynthesis of glucose tolerance factor. The deficiency causes impairment of glucose tolerance while toxicity results in renal failure, dermatitis, and pulmonary cancer. Processed meats, whole grain products, pulses, and spices are the best sources of chromium, while dairy products and most fruits and vegetables contain only small amounts. Chromium content in animal foodstuff such as meat, poultry, and fish is low which provides 2 μg Cr. Most dairy products are also low in Cr and provide <0.6 μg/serving. Whole wheat and wheat flour contain 5-10 μg of Cr/kg. Pulses, seeds, and dark chocolate may contain more chromium than most other foods. Certain spices such as black pepper contain high concentrations of chromium. Chromium is excreted principally in the urine and in small quantities in the hair, sweat, and bile. Lung cancer has been established as a consequence of hexavalent chromium exposure in smokers and nonsmokers and some cancers of other tissues such as GIT and central nervous system. The most recent data reveals the induction of skin tumors in mice by chronic drinking-water exposure to hexavalent chromium in combination with solar ultraviolet light. Chromium deficiency is difficult to document because of the very low levels present in blood, while tissue levels are 10 times higher. If concentrations of chromium are lower than the normal value of 0.14-0.15 ng/ml for serum or 0.26 or 0.28 ng/ml for plasma it indicates the presence of a severe chromium deficiency. Raised plasma levels can coexist with a negative balance. Hyperglycemia may be associated with raised plasma chromium and increased urinary excretion, without reflecting tissue level. Chromium concentrations in urine, hair, and other tissues or body fluids have also been reported not to reflect chromium status. The role of chromium supplementation was investigated in special subgroups of patients with diabetes. Longstanding exposure with chromium will cause chronic ulcers of the skin and acute irritative dermatitis have been consistently reported in workers exposed to chromium containing materials. Inhalation of Chromium compounds causes marked irritation of the respiratory tract. Rhinitis, bronchospasm, and pneumonia. Chromium is considered to be a one of the risk factor for oral squamous cell carcinoma.

Cobal

The average human adult contain about 1.1 g with the daily requirement of 0.0001 mg/day. It is a component of Vitamin B12. It induces erythropoietin and blocks iodine uptake by the thyroid. It has a role to play in methionine metabolism where it controls the transfer of enzymes like homocysteine methyltransferase. Deficiency produces cardiomyopathy, congestive cardiac failure, pericardial effusion, polycythemia, and thyroid enlargement. The occurrence of cobalt in animal tissues was demonstrated by Bertrand and Macheboeuf in 1925 and a wide distribution was confirmed by other workers employing spectrographic methods. Cobalt is usually found in the environment combined with other elements such as oxygen, sulfur, and arsenic. Small amounts of these chemical compounds can be found in rocks, soil, plants, and animals. Most of the production of cobalt involves the metallic form used in the formation of cobalt super alloys. The term "hard metal" refers to compounds containing tungsten carbide (80-95%) combined with matrices formed from cobalt (5-20%) and nickel (0-5%). For the general population, the diet is the main source of exposure to cobalt. Meat, liver, kidney, clams, oysters, and milk all contain some cobalt. Ocean fish and sea vegetables have cobalt, but land vegetables have very little; some cobalt is available in legumes, spinach, cabbage, lettuce, beet greens, and figs. [47] The recommended daily intake of Vitamin B12 for an adult in the USA was said to be 3 μg, corresponding to 0.012 μg of cobalt. [45] Cobalt compounds are absorbed by the oral and inhalation routes and through the skin. The degree of gastrointestinal absorption depends on the dose; very small doses in the order of a few μg/kg are absorbed almost completely, whereas larger doses are less well absorbed. [46] Cobalt is not easily absorbed from the digestive tract. The body level of cobalt normally measures 80-300 mcg.

It is stored in the RBCs and the plasma, as well as in the liver, kidney, spleen, and pancreas. [49],[50] Cobalt has both beneficial and harmful effects on human health. Cobalt is beneficial for humans because it is part of Vitamin B12, which is essential to maintain human health. Cobalt (0.16-1.0 mg cobalt/kg of body weight) has also been used as a treatment for anemia, including in pregnant women because it causes erythropoiesis. Cobalt also increases RBC production in healthy people, but only at very high exposure levels. Deficiency of cobalt also leads to fatigue, digestive disorders, and neuromuscular problems. As cobalt's deficiency leads to decreased availability of B12, there is an increase of many symptoms and problems related to B12 deficiency, particularly pernicious anemia, and nerve damage. [51] Cobalt is excreted in both the urine and the fect, independent to the route of exposure (inhalation, injection or ingestion) most cobalt will be eliminated rapidly. In one cohort study of people with hip prosthesis, there was a significant increase in the incidence of lymphatic and hematopoietic malignancies, and significant deficits of breast and colorectal cancer.

Manganese (Mn)

Manganese content of foods varies greatly. Peterson and Skinner and Schroeder *et al*. found the highest concentrations in nuts, grains, and cereals; the lowest in dairy products, meat, poultry, fish, and seafood. Relatively high concentrations of manganese were found in soluble ("instant") coffee and tea and account for 10% of the total daily intake. The total body content average human adult has about 15 mg of manganese, typically seen in nucleic acid. Daily requirement is about 2-5 mg/day. Manganese acts as an activator of enzyme and as a component of metalloenzymes. They have a role to play in oxidative phosphorylation, fatty acids and cholesterol metabolism, mucopolysaccharide metabolism, and urea cycle. Manganese is found in all mammalian tissues with concentrations ranging from 0.3 to 2.9 μg manganese/g. Tissues rich in mitochondria and pigments (e.g., retina, dark skin) tend to have high manganese concentrations. Bone, liver, pancreas, and kidney typically have higher manganese concentrations than other tissues. The largest tissue store of manganese is in the bone. [53] Bone, liver, pancreas, and kidney typically have higher manganese concentrations than other tissues. The largest tissue store of manganese is in the bone. [53] In hydroxyapatite crystals of enamel, more than 49 elements are found, one of them being manganese, mostly in very small percentage. The concentrations of manganese in enamel are 0.08-20 ppm, equivalent 0.08-20 mg/kg, and in dentine are from 0.6 to 1000 ppm. Mn concentration is higher in the outer surface of enamel than in enamel-dentin border, and higher in permanent than in primary dentition.

Some of the enzymes which are present along with magnesium are arginase, diamine oxidase, pyruvate carboxylate, phosphoglucomutase, succinate dehydrogenase, glutamine synthetase, superoxide dismutase. The deficiency cause bleeding disorders due to increased prothrombin time while accumulation over a long period causes anorexia, apathy, headache impotence, leg cramps, speech disturbance, encephalitis like syndrome and parkinsonian like syndrome. Psychosis may also occur.

Selenium

The relationship between selenium and oral cancer has not yet been understood clearly, but there is some evidence observed that there is a relationship between selenium and Keshan syndrome.Few studies have shown that prolonged deficiency of selenium produces this syndrome's features in animals such as failure growth in rats and muscle diseases in sheep. A selenium responsive clinical syndrome in humans is described in some pathological conditions. In humans, they observed that those who take oral self-medication containing selenium causes muscular complications. Low blood levels of selenium observed in some pathological conditions such as colonic, gastric and pancreatic carcinoma and cirrhosis. Increased selenium intake may cause Keshan syndrome. Keshan disease was first described in 1935 in North China. Clinically Keshan disease showed acute and chronic episodes of cardiogenic shock, enlarged heart, congestive heart failure, and cardiac arrhythmias. The etiology of Keshan disease is still perplexing. There are numerous hypothesis suggested by different studies such as viral infections, environmental intoxication, mycotoxins, and nutritional deficiency. The hypothesis that relates with the deficiency of selenium is the most accepted hypothesis.

Fluorine

Fluorine is a lightest element in Group VII of the periodic table, with atomic number 9. Fluorine plays an important role in the hard tissues of the body such as bone and teeth. It helps in producing denser bones and fluoride has been suggested as a therapeutic agent in the treatment of osteoporosis. It is thought that fluoride, in conjunction with calcium, stimulates osteoblastic activity. It gets integrated into the bone matrix as fluorapatite which in turn increases the hardness of bones. Fluorine has profound anti-enzyme properties and prevents dental caries. The increased fluoride utilization could be responsible for the anticariogenic action. Fluoride or fluorine deficiency is a hypothetical disorder, which may cause increased dental caries and possibly osteoporosis due to a lack of fluoride in the diet. High levels of dietary fluoride cause fluorosis (bone disease) and mottling of teeth. High levels of fluoride cause dental lesions, periosteal hyperostosis, calcification of ligaments, and lameness. Crippling fluorosis in human is observed in persons exposed to very high intake (>20 mg/day) over a period of several years. Acute toxicity of fluoride is very rare and can occur due to a single ingestion of

a large amount of fluoride and can be fatal. The amount of fluoride considered lethal when taken orally is 35-70 mg F/kg body weight. Symptoms of acute toxicity occur rapidly. There is a diffuse abdominal pain, diarrhea, vomiting, excess salivation, and thirst. Chronic toxicity is caused due to long-term ingestion of smaller amounts of fluoride in drinking-water. Excessive fluoride more than 8 ppm in drinking water daily for many years can lead to skeletal and dental fluorosis. Severe cases are normally found only in warm climates where drinking-water contains very high levels of fluoride. Due to chronic toxicity, bone density slowly increases; the joints stiffen and become painful.

Dental fluorosis may be easily recognized but the skeletal involvement is not clinically obvious until the advanced stage and early cases may be misdiagnosed as rheumatoid arthritis or osteoarthritis. Fluoride increases the stability of the crystal lattice in bone, but makes bone more brittle. The total quantity of fluoride ingested is the single most important factor in determining the clinical course of skeletal fluorosis; the severity of symptoms correlates directly with the level and duration of exposure. Bone changes observed in human skeletal fluorosis are structural and functional, with a combination of osteosclerosis, osteomalacia, osteoporosis and exostosis formation, and secondary hyperparathyroidism in a proportion of patients. At very high fluoride concentrations, stages 2 and 3 of skeletal fluorosis are likely to occur. The clinical signs of these stages are chronic joint pain, dose-related calcification of ligaments, osteosclerosis, possible osteoporosis of long bones, and in severe cases, muscle wasting, and neurological defects. Because some of the clinical symptoms mimic arthritis, the first two clinical phases of skeletal fluorosis could be easily misdiagnosed.

Iodine

Iodine is a vital micronutrient required at all stages of life; fetal life and early childhood being the most critical phases of requirement. Iodine is an essential constituent of the thyroid hormones thyroxine (T4 tetraiodothyronine) and (T3 triiodothyronine). It also plays an important role in the functioning of the parathyroid glands. Iodine also promotes general growth and development within the body as well as aiding in metabolism. Because of its role in the metabolism, the symptoms of an iodine deficiency can be far reaching. Even though it is so important to proper functioning of the human organism, iodine deficiency is not uncommon. Severe iodine deficiency often occurs in individuals who have thyroid disease and are hyperthyroid or those who have a goiter from thyroid malfunction. Symptoms of iodine deficiency may include extreme fatigue, slowing of both physical and mental processes, weight gain, facial puffiness, constipation, and lethargy. Babies born to iodine deficient mothers may be lethargic and difficult to feed. If they are left untreated, it is likely that they will develop cretinism and end up suffering poor overall growth and mental retardation

Iodine overload is less common compared with its deficit though it is unfavorable, as well as a lack of it. The literature provides information demonstrating that intake of iodine from seaweeds is safe because iodine is organically bound and is not cumulated in the body. If its intake is exceeded, it is excreted with urine, mainly during the 1 st day. Organically bound iodine is harmless, even with prolonged use at high doses. For example, at intake of 1-5 mg of iodine with seaweeds by healthy people, all iodine is excreted with urine within 48 h. Only very high doses of organic iodine from seaweeds may cause unfavorable effects on the function of the thyroid gland. Excess iodine can cause as thyrotoxicosis so as hyperthyroidism as well as chronic thyroiditis, hashimoto's thyroiditis and even may increase the risk of thyroid gland cancer.

Techniques to detect trace elements

Recently trace elements content of food and tissues has been created interest among research scholars. Such determinations required sensitivity and accurate methods of analysis. Most of the trace elements are estimated with a help of colorimetric and spectrographic methods of analysis.

Atomic absorption spectrometry-based on flames arcs and sparks (flame by electrothermal)

Emission spectroscopic methods.

- Neutron activation analysis.
- Electrochemical methods.
- Isotope dilution mass spectrometry.
- Atomic X-ray fluorescence spectroscopy.

For a single elements analysis, atomic spectroscopy and electrochemical methods are frequently applied. For multi elements tech, NAA and spectroscopic methods are used.

Problems in detecting tracing elements

The problem of analytical inaccuracy and sample contamination is the source of error in trace element studies. Accuracy in the analysis can be overcome by using properly graded instruments, avoiding operator bias, ambient temperature, and pressure. Sample contamination may occur at the collection device or storage devices or air or chemical reagents or lab instruments. The method should also include standard reference materials to avoid errors, in both sample storage and analysis.

CONCLUSION

Human beings are living with the food. This food is the combination of elements to the body. The body contains lot of

elements. When the level of the chemical or compound or minerals are reduced or increased there is a chance of diseases. So this device will check the chemicals, mineral and other elements in the body and helps the people to take the medicine or advice then proper food to take to gain health. With this regular check up the man can live long happily. With the artificial intelligence and the database stored for different kind of diseases this kit ask for the symptoms from the patients and analyse, diagnose the disease and provide the instruction ,medicines to take regularly . If this device is devised then no need of doctor and the people need not to pay for the doctor often. moreover they can live happily without any diseases.

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