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Medical Geology: A New Discipline from Around the World

Gawade V.S.^{ID}
Department of Pharmaceutical Chemistry, Dr. D. Y. Patil Institute of Pharmaceutical Sciences and Research, Pimpri, Pune 411018, India.

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ABSTRACT

Medical Geology, the study of the effects of geology and processes on animal and human health, is an emerging integrated discipline that integrates geoscience, biomedical, and community communities to solve many environmental health problems. Among the Medical Geology described in this review are examples of the scarcity and toxicity of exposure to a trace element. Goiter is a widespread and potentially dangerous health problem caused by iodine deficiency. In many places' deficiency is caused by low concentrations of iodine in the rock. Similarly, low selenium deficiency has been cited as a major cause of juvenile cardiomyopathy and muscle abnormalities. Excessive exposure to arsenic is one of the most widespread problems of Medical Geology affecting more than 100 million people in Bangladesh, India, China, Europe, Africa and North and South America. Arsenic exposure is mainly caused by naturally high levels in groundwater but the burning of mineral coal also causes arsenic toxicity. Dental and skeletal fluorosis also have side effects the health of millions of people around the world and, like arsenic, is due to the naturally high concentration in drinking water and, to a lesser extent, the heat of coal. Other issues of Medical Geology described include geophagia, the deliberate swallowing of soil, exposure to radon, and the inclusion of high concentrations of organic chemicals in drinking water. Geoscience and biomedical / public health researchers are coming together to help reduce this health problems and various non-traditional problems of geologist scientists such as vector-borne diseases.

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1. Introduction

Medical geology is a new and well-defined discipline that investigates the effects of geology and geological processes on public health. The breadth and scope of medical geology includes: (1) Identification of natural and anthropogenic resources of environmental hazards; (2) Learning to predict the movement and conversion of chemicals that cause infectious and other diseases over time and space and (3) Understanding of how people are exposed to such things and what can be done to reduce or prevent such exposure. Emerging diseases can give the medical community a host of serious problems. However, emerging guidelines can give the medical community new opportunities to deal with a variety of health problems including emerging diseases. One such guideline that emerges is Medical Geology [1]. Medical Geology is a fast-growing and powerful discipline that helps the medical community in the Asia Pacific region and beyond to pursue a wide variety of environmental health issues. In this article we give a look at everything else in health problems faced by staff in this emerging discipline. While terminology may be relatively new, medical geology is a new start. Thousands of years ago, Hippocrates and Aristotle noted the link between natural factors and the spread of

various diseases. In ancient China and India, minerals are understood to be healing and potentially dangerous structures. However, the twentieth century celebrated reductionist science, and the word "medical geology" now strikes many as novel. Definition of medical geology as a scientific discipline that examines the effects of geological processes and processes on humans and the health of the ecosystem includes natural and anthropogenic resources for potential health problems, and means that wildlife and plant diseases are included [2]. The consensus reached at a recent conference was that language accuracy should be compromised. The most accurate term for this field of research, hydro, biogeo, chemo, epidemio, patho-ecology will not be used for obvious reasons. The working group, Medical Geology: Earth Systems, Resource Use, and Human Health, met in Washington, DC on June 7-8, 2002, as part of the International Society for Ecosystem Health's. The working group decided to keep using the word "medical geology," recognising that the most important issue was to emphasise the wider meaning described above. Although medical geology "is less than appropriate to describe this discipline, it is easy to apply and remember, and accessible to policy makers and community groups - both identified as important in achieving these promotional activities. Among the environmental health problems that need to be addressed by geologists and the medical community include: exposure to natural dust and radiation; exposure to toxic levels of trace elements such as arsenic and mercury; lack of trace element; naturally occurring organic matter and non-organic matter in drinking water; identifying and affecting volcanic

* Corresponding author.

Mr. Gawade.V.S. Assistant Professor, Department of Pharmaceutical chemistry, Dr. D.Y. Patil Institute of Pharmaceutical Sciences & Research, Pimpri, Pune 411018, India.
Ph: +91-8830699204
E-mail address: vaibhav.gawade@dypvp.edu.in

eruptions, etc. Geoscientist have also developed a wealth of tools and information that can be used by the public health community to study vector-borne diseases, to model the spread of contaminants in surface and groundwater, and can be used in occupational health problems due to exposure to minerals [3].

2. Naturally Occurring Dusts

Exposure to mineral dust can cause many respiratory problems. Dust can be produced from minerals or coal, sandblasting, and fumes from fires (natural and man-made) or simply from the air dispersing minerals with fine grains on the surface of the earth. Asbestos is a diverse group of minerals that contain several common elements; The subdivision into long thin strands, heat resistance, and chemical insoluble. In the 1980's the U.S. medical community realized that the presence of respiratory asbestos fibers could cause serious health problems including mesothelioma, lung cancer, and asbestosis. As a result, many commercial asbestos mines were closed and joint efforts were made to remove asbestos from schools, workplaces, and public buildings. Unfortunately, the problem did not end there. Recently, it has been found that small amounts of asbestos are associated with investments in vermiculite, less minerals are used segregation, packaging, cat litter, and other applications, have created serious health problems in the mining community of Libby, Montana, USA [1]. Lung abnormalities (such as stiffness of the application or cuts) occurred in about 18 percent of adults tested

3. Trace Element Exposure: Deficiency and Toxicity

Trace elements play an important role in normal body structure and in the body function of animals and humans. 22 elements are known or considered "essential" to humans and other animals. Macronutrients are needed in large quantities (eg, grams per kilogram of food), and micronutrients are needed in very small amounts (eg microgram-to milligrams per kilogram of food). Sixteen elements are established as essential to good health. Calcium, phosphorus, magnesium, and fluoride, for example, are needed for bone and skin function. Sodium, potassium and chloride are needed to maintain water and electrolyte balance in cells. Zinc, copper, selenium, manganese, and molybdenum are important components of enzymes or act as carriers (iron) of ligands that are essential for metabolism. Chemical factors are also important in the functioning of the endocrine system. For example, iodine is an important component of the thyroid gland thyroxine, and chromium is an atom of the hormone-like glucose tolerance factor. Because all of these are critical functions of life, many tissue levels of "essential nutrients" tend to be controlled within certain stages, and depend on specific physiological processes, especially homeostatic control of enteric insertion, tissue retention, and / or extraction. Changes in these body processes can increase the effects of malnutrition or excessive trace elements. Food is a major source of food for humans and animals. However, other sources such as deliberately eating soil (geophagia) and water can also contribute to the diet of trace elements. Diseases due to traces of error and overdose are known as iodine, copper, zinc, selenium, molybdenum, manganese, iron, calcium, arsenic and cadmium [4]. Chronic diseases are associated with soils deficiency of selenium and iodine has been described in at least two common cases, juvenile cardiomyopathy "Keshan Disease" and iodine deficiency disorders include goiter and myxedematous cretinism [5,6] respectively. In the following sections, examples of poor health are described due to lack of resources and excessive following. Endless exposure to non-essential substances such as arsenic has also been described.

4. Diseases Due To Trace Element Deficiencies

Iodine:

The link between geology and lack of trace elements is well documented with iodine. Iodine Deficiency Disorders (IDD) include goiter (enlargement of the thyroid gland), cretinism (mental retardation with physical deformities), decreased IQ, early pregnancy, and birth defects. In ancient China, Greece and Egypt and within the Indian Journal of Advances in Chemical Science 1 (2012) 57-6459 Incas, people affected by goiter, were given seaweed to provide the necessary iodine [6]. Goiter is still a deadly disease in many parts of the world. China

alone has 425 million people (40% of the world's population) at risk of IDD. In all, more than a billion people, especially those living in developing countries, are at risk of IDD. In all areas where the risk of IDD is high, the iodine content in drinking water is very low due to the low concentration of iodine in the rock.



Figure 1: Goiter

Selenium:

However, selenium deficiency (due to low selenium soils) has been linked to serious physiological disability and organ damage, including juvenile cardiomyopathy (Keshan disease) and muscular defects in adults (Kashin-Beck disease). Scientists speculated that these diseases had geological origins in the 1960s, and the possible solution was discovered in the 1970s. These diseases were always found in low-selenium soils [3]. Dietary selenium has had a great deal of success in the prevention and treatment of these diseases. Low selenium levels are thought to lead to a variety of illnesses such as impaired fertility, multiple cancers, infectious diseases, and, due to its antioxidant properties, rapid ageing. For example, in the body, the ratio of selenium to arsenic may modulate the toxic effects of either element alone [7].



Figure 2: Kashin-Beck disease

5. Toxicity of Essential and Nonessential Elements

Arsenic:

Human carcinogens include arsenic and arsenic compounds [8]. Arsenic exposure can occur from a variety of anthropogenic sources, including mining, pesticides, pharmaceuticals, glass and

microelectronics, and, most commonly, natural sources. Arsenic can be ingested or inhaled, resulting in exposure. To some degree, dermal touch and the parenteral route are used. Drinking arsenic-contaminated water is a big public health problem. Acute and persistent arsenic contamination through drinking water has been documented in many countries around the world, where a significant proportion of the drinking water is polluted with high arsenic concentrations. Arsenic toxicity has been linked to coronary and peripheral vascular disease, developmental abnormalities, neurologic and neuro behavioural disorders, asthma, hearing loss, portal fibrosis, and hematologic disorders. Anemia, leukopenia, and eosinophilia are examples of diseases, as are cancers. Many arsenic-polluted areas have significantly higher standardised mortality rates and composite mortality rates for cancers of the skin, lung, liver, urinary bladder, kidney, and colon [9-11]. High levels of arsenic in drinking water have caused severe health issues for millions of people in Bangladesh, India, China, Taiwan, Vietnam, Mexico, and elsewhere [12]. Geoscientists from various countries are collaborating. With public health authorities to find solutions to these issues. Geoscientists are attempting to identify the source rocks from which arsenic is being leached into ground water by observing the geological and hydrological environments. They are also attempting to ascertain the circumstances under which the arsenic is mobilised. Arsenic, for example, may be desorbed and dissolved from iron oxide minerals by anaerobic (oxygen-deficient) groundwater, or it could be extracted from the dissolution of arsenic-bearing sulphide minerals like pyrite by oxygenated waters [13]. Understanding the processes by which arsenic is mobilised would enable public health officials worldwide to recognise aquifers that could pose a danger to their communities. Arsenic poisoning is undetectable in its early stages and takes between 8 and 14 years to have an effect on health, depending on the amount of arsenic consumed. Person nutritional status and immune response Arsenic is a poisonous agent to human health, and toxicity is divided into acute, sub-acute, and chronic toxicity based on the amount of arsenic consumed. It is a silent assassin. It is four times as toxic as mercury, with a lethal dose (LD) of 125 milligrammes for humans. The last form of toxicity is caused by contaminated drinking water. Human exposure to arsenic occurs primarily through inhalation, ingestion, and skin touch. Chronic arsenic ingestion by drinking water is known to cause skin cancer, and there is strong evidence that it raises the risk of bladder, lung, kidney, liver, colon, and prostate cancer. Arsenic is also linked to a variety of non-neoplastic diseases, including heart disease, cerebrovascular disease, pulmonary disease, diabetes mellitus, and diseases of the arteries, arterioles, and capillaries [14]. Individuals suffering from chronic Hepatitis B, protein deficiency, or malnutrition may be more vulnerable to the effects of arsenic [15]. Other populations at risk include children and the elderly. Skin thickening and discoloration are symptoms of arsenic poisoning, as are stomach pain, nausea, vomiting, diarrhoea, numbness in the hands and feet, partial paralysis, and blindness. Toxicity is dose dependent, especially on the rate of arsenic compound ingestion and excretion from the body, but it also accumulates in the body and passes slowly out through hair and nails. The majority of arsenic consumed is excreted from the body through urine, stool, skin, hair, nail, and breath. Arsenic accumulates in tissues and inhibits cellular enzyme functions when consumed in excess. When the husband finds arsenicosis symptoms on her body, he often refuses to keep her under the same roof. If the woman is lucky, her husband will simply return her to her parents for treatment. In most cases, though, the husband considers the marital partnership to be too dangerous and seeks divorce. Women are unable to marry, and husbands have deserted their wives. As a result, divorced women have no place in society and become destitute with their children. It becomes difficult for parents in villages to marry off their affected daughters. Arsenicosis also has an effect on the productivity of patients, who are often incapacitated and unable to function, becoming liabilities for their families. Since their birth, poor children have been drinking contaminated water. They, too, could develop arsenicosis. It would be extremely difficult, if not impossible, for the parents of a troubled young woman to find a suitable groom for her without offering a large dowry. Dowry provision is already a challenging social problem, but it will be exacerbated by the arsenic problem.



Figure 3: Arsenicosis symptoms include spots on the hands

Fluoride:

Toxic effects in humans are caused by overexposure to trace elements in geologic materials. Animals and humans Fluorine is one of the trace elements that has received the most attention in this regard. At levels of at least 0.7 mg/L in drinking water, the fluoride ion (F⁻) enhances bone development and decreases dental caries. Excess fluoride (> 1 mg/L) exposure, on the other hand, can cause fluorosis of the enamel (tooth mottling) and bone (skeletal fluorosis) [14].

Dental Fluorosis:

Ingestion of water with a fluoride concentration greater than 1.5 – 2.0 mg/l can cause dental mottling, an early sign of dental fluorosis marked by opaque white patches on teeth. Teeth display brown to black staining in advanced stages of dental fluorosis, accompanied by pitting of tooth surfaces. Dental fluorosis resulted in substantial additional dental costs (tooth deterioration) as well as significant physiological stress for the affected population. In India, dental fluorosis is prevalent in 14 states and 150,000 villages. The issues are most severe in the states of Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, and Uttar Pradesh. Figure 4 depicts various types of mottling.



Figure 4: Dental Fluorosis

Skeletal Fluorosis:

Skeletal fluorosis may occur when fluoride levels in drinking water reach 4-8 mg/l, resulting in increased bone density, calcification of ligaments, rheumatic or arthritic pain in joints and muscles, joint stiffness and rigidity, vertebral column folding, and prolonged bone forming or osteosclerosis are all symptoms of osteosclerosis a skeletal fluorosis symptom [17,18]. Figure-5 depicts crippling skeletal fluorosis caused by a water source containing more than 10 mg/l [19].

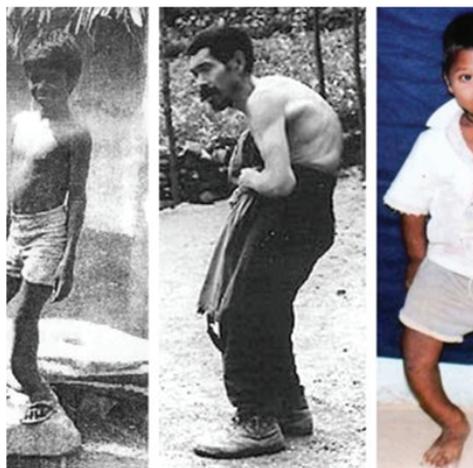


Figure 5: Extent of Skeletal Fluorosis

6. Nitrates as a Health Hazard

In India, high levels of groundwater nitrate (over 45 ppm) have been found in many areas Andhra Pradesh, Bihar, Delhi, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamilnadu, Rajasthan, West Bengal and Uttar Pradesh [20]. The highest concentration of 3080 ppm groundwater nitrate was obtained at Bikaner in Rajasthan [21]. A study by (A.G.S Reddy et al., 2007) in the Anantapur region revealed that 65% of the samples showed nitrate levels above the desired threshold (45 ppm). Nitrate sources in groundwater can be considered in four categories: (1) Natural resources (2) waste (3) irrigated agriculture and (4) successive agriculture. Major sources include Energy-efficient animal nitrate production is derived from the extensive use of animal waste, irrigation and crop farming in agriculture, and nitrate from minerals derived from organic nitrogen fertilizers and from overuse. Septic tank system and other sources, such as land filling can be stressful in designated areas [22]. High concentrations of nitrate in drinking water cause many health problems especially in children and small animals. Due to its dangers, the approved nitrate limit for drinking water has been reduced from 100 mg / l to 45 mg / l by the Bureau of Indian rates in recent years. Although methemoglobinemia (blue-baby syndrome) is a life-threatening side effect of nitrate exposure, there are long, equally serious words, side effects. In several studies, exposure to high levels of nitrate in drinking water has been linked to a wide range of effects ranging from thyroid enlargement to 15 types of cancer and two types of congenital malformations and high blood pressure [23]. Research shows a clear relationship between the growing values of stomach cancer by increased nitrate intake [24]. As a result of the continued use of high nitrate in water may not be as noticeable as in the case of fluoride, locals have complained of repeated suffering and intestinal problems in the south-eastern part of Anantapur district, Andhra Pradesh, India.

7. Other Medical Geology Issues

Geophagia:

Geophagia (or geophagy) is another subject of interest in medical geology. Geophagia can be described as the deliberate importation of soil, a common practice among members of the animal kingdom, including certain individuals. The soil is east of the ground, but in most cases, there is a tradition of preferring soil from special sources such as termite mounds. Geophagia is considered by many nutritionists to be a learning process response in which clay and soil minerals are added directly to reduce the toxicity of various dietary components or as a built-in response to a lack of healthy food caused by malnutrition. Geophagy finds a renewed and critical interest within scientific research the community.

Radon:

Exposure to natural gas such as radon can be harmful. Geographical

elements are the most important factor in controlling the source and distribution of radon. Very high levels of radon extraction are associated with certain types of rock and unlabelled deposits, including some granite, phosphatic rocks, and shales rich in organic matter. The release of radon from rocks and soil is largely controlled by the types of minerals in which uranium and radium occur. Radon levels in outdoor air, indoor air, ground air, and groundwater can vary greatly [25]. Radon extracted from rocks and soil is rapidly purified in the atmosphere. Focusing on the open air tends to be very low and probably does not pose a risk (Appleton, 2005). Radon entering windless buildings, caves, mines and mines can achieve a high-risk focus.

Asbestos:

Asbestos is the name of a group of naturally occurring silicate minerals into threads. The fibres are tough, long-lasting, and resistant to heat and burn. There are several types of asbestos fibers, three of which have been used commercially: Chrysotile, or white asbestos, originates mainly in Canada, and is widely used in the US It is white in color and is found in serpentine rock. The asbestos variety, or brown, originates in southern Africa. Crocidolite, also known as blue asbestos, is found in southern Africa and Australia. We have chosen "asbestos" as a whole, because it has been studied as a key mineral in its composition as silicate to harmful fibers. Dust from other silicates showed similar health effects on the work, but did not detect asbestos thunderstorms. Asbestos mines around the world have been found to pose a health hazard in the workplace to miners and miners in related processing industries. The first details of the asbestos risk came from miners in the extraction process, but it gradually became clear that workers in all asbestos-using industries were also showing signs of health impacts. Most studies focus on asbestos as a dangerous mineral product and safety issues related to respiratory exposure asbestos particles in mines and surrounding areas. The most difficult job exposure is the high contact with asbestos particles in a breathable manner. Along with coal and other silicate cones, the risk of asbestos mining is closely related to damage to respiratory and lung function.

Uranium:

The uranium mine has a long history, but many scientists recognize that it is only the last 30 years in which the health effects of radiation exposure in mines have been fully discussed. Many studies have focused on lung cancer, the dangers of which are now being fully investigated. This type of radiation cancer is now seen as one of the most important radiation damages known to occur among workers exposed to ionizing radiation. Uranium mining poses a threat in 2 ways, with dust and released radon - α radioactive natural gas. Radon's main stem is radon-222, from uranium-238 located in various locations throughout the soil. Radon is found everywhere in the atmosphere but has a low efficiency in itself. However, during the mining process, the dust is blown away by the miners. For example, as one study reported on the East German Uranium mines, some mines in the past were labelled for air-conditioning and forced air-conditioning. Dust levels were very high and there was a significant exhalative insertion of alpha-releasing substances, mainly from short-lived radon seed. However, long-term alpha-releasing substances such as uranium-238 contribute significantly to radiation exposure [26]. The daughters of Radon particles are subject to alpha irradiation of the bronchial epithelium. Epidemiological studies by miners indicate that radon exposure poses a significant risk of lung cancer in these workers but "to what extent?" and "how?" still under investigation.

8. Conclusion

Medical geology's goals are to identify harmful geologic agents, determine exposure conditions that promote degenerative health conditions, and develop sound policies, strategies, programmes, and strategies to address these issues eliminate or reduce health risks. Communication and communication are needed between geosciences, biomedical, and community health organizations to protect human health from the harmful effects of physical, chemical and environmental factors on the environment. We recommend that Medical geology be included in higher education courses so that students will be able to communicate between geology and health and be encouraged to

take Medical Geology courses. The emerging field of Medical Geology promises to expand the foundation of environmental health knowledge, as well as to contribute to significant improvements in the well-being of the global community. An important function is to promote the adoption of medical discipline geology. This can help support research by raising awareness of funding agencies and decision-makers. The general public should be educated about it the value of this sector, and not just its promise of finding practical, effective and serious solutions public health problems, but because people can encourage their elected leaders to fight for this important cause. Given the philosophy and goals of ISEH, the link between the Organization and the IUGS Medical Geology Initiative could benefit both organizations. These cohesive societies can form a strong, self-supporting scientific science field.

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None

10. Conflict Of Interest

Author not declare any conflict of interest

11. Ethical Consideration

None

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