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Guest Articles

Water – The Life Saver

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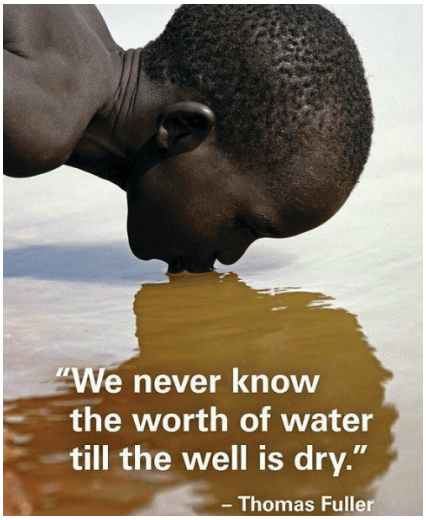

Water is a truly amazing resource on Earth that nature offers us absolutely free of charge, and it is ranked second only to oxygen as being essential for life. More than 70% of the Earth's surface is covered with water. However, fresh water comprises only 2.5% of the total water content on Earth and the rest is too salty to use. From the available fresh water content, less than 1% is easily accessible for Earth's biota. These accessible fresh water sources are streams, lakes, reservoirs and underground sources.

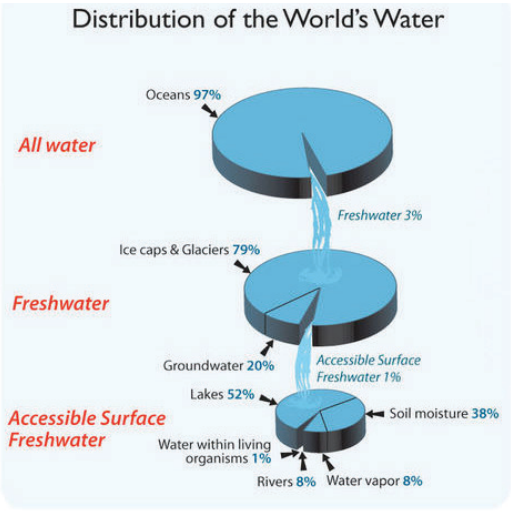

Figure 1: Percentage distribution of water on Earth

Biological availability in human body

More than half of the body weight is made up of water. The quantity of water in our body is determined in particular by the age: young people have a higher quantity of water in their bodies than old people. Hence, as we grow older the quantity of water present in our organs diminishes. Furthermore, distinct parts of the human body contain different quantities of water as it depends on the function of the different organs of our body.

Importance of water

The human body can resist only a few days without water! Without food, we can survive much longer!

Water Therapy: Begin to drink water early in the morning…

In the early morning, drink 3 glasses of fresh drinking water (1.0 liter). It is essential to note that nothing else – neither drinks nor solid foods should be taken within the one hour before and after the therapy.

Without spending money on medicine, tablets, injections, diagnosis and doctor fees, just by drinking fresh water, one will find that many diseases (headache, blood pressure, anemia, obesity, arthritis, rheumatism, cough, asthma, bronchitis, meningitis, constipation, diabetes, kidney stones, urogenital diseases, hyperacidity, gastroenteritis, eye diseases, irregular menstruation, leukemia, uterine cancer, breast cancer, tuberculosis *etc.*) can be cured. Therefore, consuming water regularly helps to purify the human body and restores good health.

Daily requirement and uses of water

Every day, our body loses 2-3 quarts (8-12 glasses) of water through sweat, urination and evaporation. Therefore, it is important to drink at least 8-12 glasses (2.5 liters) of water per day to maintain a healthy body and to avoid heat strokes or exhaustion.

Water travels throughout the body carrying nutrients, oxygen, and wastes to and from the cells and organs. Moreover, it takes part in regulating the body temperature and helps to maintain a healthy weight by assisting the digestion and absorption of food. Furthermore, it cushions the joints, and protects the tissues and organs from vibrations, and acts as a lubricant in the joints, mouth and digestive system. Water is really important for maintaining hygiene, and to prevent proliferation of harmful bacteria in our body and to avoid their transmission to others.

In addition to that, water is especially valuable for sustaining life. Water is used for domestic, commercial, agricultural, irrigation, industrial, mining, livestock, hydro-power generation and public supply as well as for many other purposes. These categories of water usage show continual increase due to the increasing population, urbanization, and industrialization. Therefore, inadequate access to safe drinking water has become a significant problem. Therefore, it is essential to make incremental efforts to keep the drinking water quality at the highest achievable level: as the quality of water is extremely important for the health and well-being of all living creatures.

Water Pollution

Water pollution has become a severe environmental problem mainly due to the extensive anthropogenic activities: direct or indirect discharging of effluents containing toxic materials into water ways without proper treatment which causes chemical, physical and biological changes in water bodies. Hence, the depletion of suitable water quality causes life threatening waterborne diseases like cholera, typhoid, diarrhea, bowel diseases, and chronic illnesses in those people who rely on these water sources for their domestic activities.

Figure 2: Water Pollution

Organic contaminants (polychlorinated biphenyls, pesticides and herbicides, petroleum wastes and organic phosphates *etc.*), inorganic contaminants (heavy metals, nitrates, fluorides and phosphates *etc.*), microbial contaminants (virus, bacteria, fungi, protozoa and pathogens *etc.*), radioactive contaminants (radio nuclides (Pu), by-products of nuclear fusions, nuclear reactors and explosive wastes *etc.*), sewage, sediments and heat are the major pollutants which contaminate the water bodies.

Therefore, waste water needs to be properly treated before being discharged into the environment or reused by the population to maintain the water cycle and long-term sustainability.

Water purification techniques

Water purification is the process of removing

harmful contaminants from contaminated water and making it suitable for reuse, drinking or irrigation. With the improvement of science and technology, a wide range of water purification techniques ranging from simple water boiling through biological water purification using organisms, to chemical treatments have been introduced. These are different methods used in water purification; Boiling, distillation, filtration (slow sand filtration, rapid sand filtration, ceramic filtration, charcoal filtration *etc.*), membrane filtration, deionization, ion exchange, adsorption, biological treatment, chemical disinfection methods (chlorination, hydrogen peroxide disinfection *etc.*), solar disinfection ozone disinfection and electrochemical treatment. It is difficult to implement these techniques due to various factors like high installation cost, complexity, requirement of high level of expertise knowledge and less awareness among the population to reuse treated effluent. Therefore, nanotechnology is being used to develop effective strategies to minimize limitations associated with water purification techniques due to its unique physicochemical and surface properties.

Nanotechnology for water purification

Water purification using nanotechnology exploits nanoscopic materials like carbon nanotubes, graphenes and alumina fibers. The impurities that nanoparticles can tackle depend on the stage of water purification to which the technique is applied.

Carbon based nanomaterials (carbon nanotube membranes, graphene *etc.*) have been used to remove almost all kinds of water contaminants including turbidity, heavy metal ions, organic dyes, oils, bacteria and viruses. Nanofibrous alumina filters and other nanofiber materials are used to remove contaminants such as viruses, bacteria, and organic and inorganic colloids at a faster rate than conventional filters. Metal oxide nanoparticles (iron oxide, zinc oxide, magnesium oxide, and titanium oxide *etc.*) are the other important nanomaterial that is used in water purification. Nanosensors based on palladium nanoparticles are also used for the analytical detection of contaminants in water bodies.

The neat nanoparticles also contain certain drawbacks such as poor stability with reduced size, easy agglomeration, reduced adsorption capacities and difficulty in separation after its usage in water purification. Hence, neat nanoparticles are incorporated into porous supporting materials like activated carbon, clay minerals, zeolites, natural and synthetic biopolymers and apatite.

Nevertheless, further research may of course explore all possibilities to find the best solution, not only for purifying water, but also for harvesting it, e.g., Metal organic frame-works are porous materials with a sponge-like chemical structure, which can be used to harvest drinkable amounts of pure water from the dry desert air. It requires no extra energy and can be used in the presence of natural sunlight.

"A drop of water is worth more than a sack of gold to a thirsty man"

If you save water, it will save you, because water is the driving force of all nature. Therefore, all human beings need to be a part of the solution, not part of the pollution.

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Guest Articles

Basics of Patenting for Scientists

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Scientific findings are published in multiple platforms such as journal articles, abstracts and theses. Intellectual assets of those findings have become freely accessible and used by other parties in order to gain commercial advantages. This can demotivate scientists, innovators and investors to create knowledge with commercial value and to invest in product development. The patent system is the legal mechanism to protect the right of obtaining commercial advantages from intellectual assets or properties. These intellectual properties (IP) can be divided into multiple categories, based on the properties of the IP as follows:

Category 1.

Literary; artworks, scientific publications and novels are a few examples for this category. These creations can be protected under the law related to copyright. In most countries, the software can also be protected under copyright law.

Category 2.

A television program or recorded musical program that is based on Copyrighted materials such as songs and music can be protected under the law concerning Copyright Related Rights.

Category 3.

Any scientific invention of a tangible product which can be protected using law related to Patent.

Category 4.

A shape of a product package or a design of a product which can be protected using the law related to the Industrial Designs or the law related to Copyright.

Category 5.

Trademarks, commercial names and marks can be protected using law related to Trademark.

Obtaining a patent for an IP created in a University research is not common in Sri Lanka. The outcome of a research project may not be patentable always, however, when required, it is essential to protect the created IP to obtain benefits. It is common practice to retain the ownership of the invention by the institute in all leading Universities around the world. However, the research team will be listed as inventors in the Patent document and economic benefits will be shared among the inventors and the University.

Reverse engineering or copying an invention must