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Water Purification techniques for household purposes

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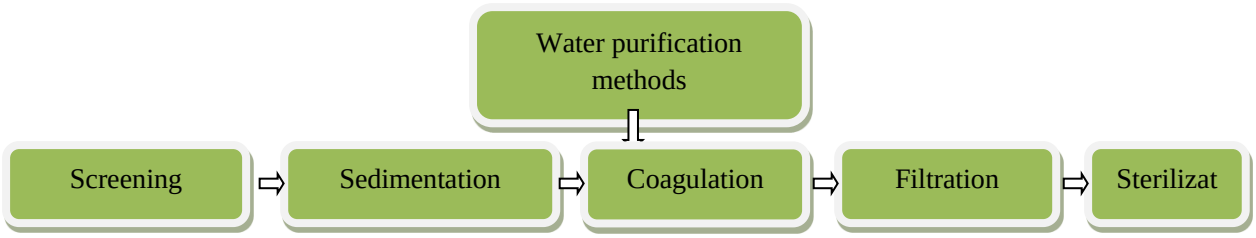
Abstract:
The present article gives review about water purification, filtration techniques and technologies that are adept till date. Purification of water is most important and sensitive in today's era because water is one of the essential sources of survival for all living beings. Water is found in many forms on earth's surface, large amount of drinking water is available on earth surface. All living beings need drinking water but human beings need them to be drunk in purified manner with rich in minerals and salts. Pure water denotes an absence of diseases causing microorganisms, bacteria, dissolved metal ions and other heavy impurities. If water is contaminated with several impurities that can be endanger lives when consumed untreated, therefore sustainable, efficient, low-priced water treatment methods are crucial in developing nations.

Keywords: purification, filtration, technologies, treatment, impurities.

Introduction:

Provide adequate amounts of quality water for human consumption is a basic need for ensuring the sustainable, long term supply of such drinking water is of national and international concern. The present paper which introduce a simple natural water purification system to produce good quality of fresh water which is safe for drinking. A Simple water treatment technique such as screening, sedimentation, coagulation, filtration, membrane filtration and sterilization are some options available to produce good quality drinking water. Methods like reverse osmosis are the available technology to produce good quality water. These systems are costly to maintain. Such system is not approved in small countries. Low cost, simple water purification methods are used for household purposes. Specific water treatment options are used by municipalities to meet local, regional or national standards are schematically summarized below



Water is the basis of human existence, but with the acceleration of industrialization, the pollution of water resources worldwide is becoming more and more serious. Usually, the pollutants in drinking water mainly include organic matter and ammonia nitrogen [1]. At present, the commonly used water treatment processes are mainly coagulation, precipitation, filtration and chlorine disinfection, but they cannot effectively remove ammonia nitrogen and organic matter [2-3]. and Chlorine disinfection can produce harmful byproduct [4].Drinking unclean water can seriously endanger public health and even affect the kidney and urogenital system [5-6].Under the situation of a significant reduction in clean water resources, it is urgent to treat the water resources of waterworks through an efficient water treatment process so that they can use it for domestic water.

Complete treatment consists of screening, coagulation, sedimentation and filtration followed by disinfection.

Screening:

Water

Screening is the first stage of the drinking water or waste water treatment process. Water is screened to remove large debris and course solids that could damaged later filter stages in the treatment plant. Water passes inward through the screens and solid matter is washed off by high pressure Water jets directed from inside of the screen .Screening is operation which is used for removal of floating and suspended solids from the wastewater .Screening is

used for removing floating papers, rages, clothes and plastics.

Sedimentation:

Sedimentation is a common way in which water is treated. It is a process that helps in removing solids that float and usually settles in water .As mentioned before; the process is carried out with the use of a sedimentation tank that also allows in removing larger solids. It is a physical water treatment process where the use of gravity enables the removal of suspended solids from the water. The effectiveness of water treatment from sedimentation depends on the size and weight of present particles in the water. Solids that are suspended in water having a similar gravity to that of water tends to remain suspended, whereas the heavier particles lead to settling. The sedimentation tanks of various shapes and sizes are used in order to carry out the sedimentation process.

Coagulation:

Coagulation is a process for combining small particles into larger aggregates and for adsorbing dissolved organic matter on to particulate aggregates so that these impurities can be removed in subsequent solid/liquid separation processes. The modern use of coagulants for water treatment started more than 100 years ago, when ferric chloride, sodium aluminate and aluminum sulfate were used as coagulant in full scale water treatment works. Mattson firstly derived that the hydrolysis products of Al. and Fe salts were more important than the trivalent ions themselves, although this approach was widely accepted and accorded its proper position in coagulation chemistry 30 years later [7].

Filtration:

Now a day's gravity sand filter and pressure filter is used for filtration process. Slow sand filter uses sand bed as a filter medium followed by a coarser material such as gravel is used to prevent sand from clogging the under drain piping. The under –drainage system is used to collect the filtered water from the filter. Slow sand filter is very effective in removing particulate matter which is greater than the pore size of the filter. Some bacteria and viruses, therefore, percolates deeper into the sand bed before removal ,however ,with passage of time, the size of the pores gets reduced because of the deposition of particulate matter and filtering effectiveness is increased. It was found that virus removal efficiency of Slow sand filter increases with increasing bed depth and decreasing rate of filtration and increasing temperature [8].The run time of the filter ranges from 60 to 80 days, but in some cases ,it may also reach 100days[9].

Sterilization:

The goal of disinfection of water is the elimination of the pathogens that are responsible for waterborne diseases. The transmission of diseases can be controlled with the treatments that substantially reduce the total number of variable microorganisms in water. Sterilization can be carried by following methods.

Boiling:

Boiling is the most common means of treating water in the home. Boiling is a very simple method of water disinfection .Heating water to a high temperature,100^0C,kills most of the pathogenic organisms, particularly viruses and bacteria causing waterborne diseases. In order for boiling to be most effective, the water must boil for at least 20 minutes. Since boiling requires a source of heat, nonconventional methods of heat generation may be needed in areas where electricity or fossil fuels are not available [10].

Chlorination:

Different form of chlorine is the most commonly use chemicals for the disinfection of water supplies. It is also active for other purposes associated with water treatment and supply, Such as prevention of algal, bacterial and general slime growths in treatment plants and pipe works, control of tastes and odors, and removal of iron, manganese and coiour [11].Chemical disinfection is another common method for making water safe to use. Chlorination is a common chemical disinfection technique that involves adding chlorine –based products such as sodium hypochlorite, calcium hypochlorite, bleaching powder to kill bacteria and viruses. Other chemical disinfectants, such as iodine and chlorine dioxide, can also be effective for disinfecting water. Using or drinking water with small amounts of chlorine, iodine or chlorine dioxide. can also be does not cause harmful health effects and provide protection against waterborne diseases.

Ultraviolet light:

Ultraviolet water purification systems purify water by using ultraviolet rays to kill microorganisms present in water. Ultra violet rays completely kill water-borne microorganisms and prevent their reproduction by disrupting their DNA. Also, UV rays do not lead to chemical changes in the water. Electromagnetic radiation, in wavelengths from 240 to 280 nm, is an effective agents for killing bacteria and other microorganisms in water[12].Conveniently, from a practical point of view, from 30% to 90%of the energy emitted by a low pressure mercury arc, which is enclosed in special UV transmitting glass, is emitted at a wavelength of 253.7nm[13].

Reverse Osmosis:

Reverse osmosis (RO) is a pressure driven membrane technology that has seen its application worldwide.RO is diffusion –controlled process in which the water is passes through RO membrane, RO system can be found today in most of the places such as kitchens, hospitals and many industries.RO process effectively removes microbes and toxins.RO

can also be used for desalination of water and treatment of peat water. Reverse osmosis is not only removes each and every impurity but it also removes most of essential minerals. Calcium and magnesium are some of the minerals that are completely lost in RO filtration. These minerals are essentials for the human body in many ways.

Table-I
Comparison of household water purification interventions

Method	Availability	Cost	Microbial value	Limitations
Boiling	Varies	Depend on fuel	High	Time consuming/High cost/Recontamination/Loss of minerals.
UV Radiation	Varies	Moderate to High	High	High cost/regular maintenance/piped water supply/Electricity is required.
Sedimentation	High	Low	Low	Time consuming/Low value
Filtration	Varies	Varies	Varies	Regular cleaning required

Conclusion:

In this paper various water filtration techniques were discussed. Taking into consideration the advantages and disadvantages of each of the techniques, it can be easily decided that which type of filtration technique is suitable for which type of region. These techniques help in getting rid of the water borne diseases. Water purification can remove all the unnecessary bacteria and a virus from water is hazardous for our health. Water purification may also improve the flavor and appearance of water. It removes unpleasant odor. Therefore, water purification provides us safe, pure and clean water to consume and use.

The various household technologies for water purification on the basis of their practically, availability and effectiveness in improving the microbiological quality of water, cost and limitations.

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