Chapter 1 : OA Guide to Water Purification

Distillation is a water purification method that utilizes heat to collect pure water in the form of vapor. This method is effective by the scientific fact that water has a lower boiling point than other contaminants and disease-causing elements found in water.

The human body requires water on a constant basis for different uses like provision of energy, detoxification, maintenance of skin health, etc. It is, therefore, important to take enough water every day. However, water used for drinking and cooking purposes needs to be contaminant free. Drinking water sources can sometimes become contaminated. Water-borne diseases and sicknesses that are caused by water-borne germs, e. Common Methods of Water Purification and Disinfection at Home Depending on the source of your water, it can also contain sediment, metals and unrequired nutrients and minerals. This calls for the need for water purification and disinfection. In this article, I will take you through some of the standard methods that you can employ at home to ensure that you have access to simple cooking and drinking water. Boiling This is a straightforward and effective method of water disinfection for drinking purposes. It is most prevalent in developing countries, though sometimes in cases of water contamination in a particular area it is also used in developed countries. You can also use it as a safety method when you go to a place where the water quality is not known. The process involves heating water in a container to its boiling point. When the water has started boiling, it should be left to do so for around a minute. At higher altitudes, when the boiling point decreases, the water should be left to boil for around 3 minutes. Boiling water does not remove any foul taste or smell that may be contained in the water. It also does not remove metals, herbicides or sediment. However, it is the surest way of killing bacteria and all other disease-causing microorganisms that may be contained in water. Water-borne disease-causing organisms are not heat resistant, and therefore, they die. After boiling, the water can then be left to cool while covered. You can then choose to pour it forth and fro using clean containers to aerate the water once more and improve its taste. Distillation Distillation is a physical method of water purification. Just like boiling, it involves heating water. However, in this case, water is usually heated till it starts vaporizing. The vapor is then directed to another container where it condenses to form pure distilled water. This way, most of the impurities that were contained in the water are removed. These include sediment, salts, minerals, and chemicals. Since it removes even the minerals that are required by the body, it is not a recommended method of water purification for drinking purposes. Chemical water Disinfection The most common chemical disinfectants are chlorine and iodine, which belong to a group of chemical substances known as halogens. It is usually in a compound with other chemicals but when in water, it is released. It is an effective disinfectant and kills the micro-organisms contained in water. However, it leaves a foul smell and taste of water. These can be removed by a carbon filter after the treatment. For efficiency of chemical disinfectants, it is advisable to filter and settle the water before treatment. Contaminated water is then exposed to this light for treatment. It is an efficient and trusted method of water purification. When UV- Crays are exposed to the microorganisms contained in the water, the DNA of the microorganisms absorbs the rays. After absorption, these rays alter the DNA of the pathogens is such a way that they can no longer produce, and they permanently die. This process of altering their DNA is called inactivation. The threat of water-borne diseases are eliminated, and water made safe for drinking purposes. However, it is important to note that there are some substances that affect the effectiveness of UV light water treatment method. These include suspended solids, iron, manganese, calcium, magnesium and sediment. It is, therefore, advisable if your water contains such contaminants, to employ pretreatment methods such as a sediment filter, carbon filter and water softening. Filtration Filtration is a crucial water purification method for homes. Some people use personal safe water, which may contain sediment as well as metals. It can also contain bacteria as well as excessive minerals, depending on the area. Others who use municipal water may have water that has the foul taste and smell of chlorine. This is where water filters come in handy. Their many different types of water filters, depending on the water available in your local area. If the water in your area contains a lot of sediment and no microorganisms, then you can go for a simple sediment filter. If the water contains chlorine, you can buy a carbon filter. However, certain types

of water filters offer the best services and quality in water filtration. They combine all these filters for efficiency and effectiveness to guarantee you highly purified drinking and cooking water. These systems are called reverse osmosis water filtration systems. Reverse Osmosis Water Filtration Systems Under these systems, we shall look at the most efficient one, The 5 stage reverse osmosis water filtration system. As according to its name, it has five stages that include; The 5 Micron Polypropylene Sediment Filter This removes all solid substances above 5 microns that are contained in the water. Carbon Water Filter It removes chlorine, lead, herbicides, and pesticides among other contaminants. It offers excellent filtration of all microorganisms with the application of pressure. Carbon Postfilter It polishes the water for improved quality Conclusion Water purification and disinfection are crucial. It ensures that you and your family are in good health, free from the dangers posed by consumption of contaminated water. It is, therefore, crucial to choose a method of water purification for your home, depending on the quality of water available in your local area. If you are not sure about the quality, or you have moved to a new place, you can have a water professional do a water test to know the appropriate measures of purification to take.

Chapter 2 : Consent Form | Outdoor Life

Water purification is the removal of contaminants from raw water to produce drinking water that is pure enough for human consumption or for industrial use. Substances that are removed during the.

HomeQuicks Staff Oct 27, Water is life for all living beings. Be it plants or animals, potable water is essential for survival. But, water from all sources of water is not safe for consumption. Drinking water or potable water is water that is supplied for human consumption. The purity of potable water is a major concern throughout the world. It must comply with the scientific standards set for safe consumption, so that people drinking it should not suffer from immediate or long-term health effects. In short, it should meet the State and Local water quality standards. The United States is known to have one of the purest water supplies in the world. But, in many other countries, people still suffer from acute or chronic illnesses due to drinking of contaminated water. This balance of water remains fairly constant because of the phenomenon of water cycle. However, we are still struggling for getting sufficient amounts of drinking water. Since ocean water is saline and glaciers are frozen water, they cannot be accessed directly. As for the supplied water, it is often contaminated with pathogens and other dissolved solids, which are harmful. Water source can broadly divided into surface water and ground water. Rainwater contributes to both. Surface water bodies such as rivers, lakes and reservoirs also have dust particles, microorganisms, minerals and organic matter dissolved in them. Similarly, ground water contains lots of dissolved minerals. The outcome is that water obtained from these natural sources is not clean, but polluted in one way or the other. Thus, it needs to be treated to meet certain standards before using for consumption. Based on the source, there are various types of water pollution such as groundwater pollution, surface water pollution and so on. And the effects of water pollution differ based upon the source and the concentration of the contaminants. According to the World Health Organization WHO report published in , drinking water has been categorized into three, and described in the form of "drinking water ladder". Common Methods for Purifying Drinking Water By drinking water purification, we mean the process of removing undesirable biological and chemical contaminants from raw water, so as to make water fit for human consumption. The methodologies for purifying drinking water are totally different from the ones adopted for wastewater treatment. In addition, water purification is done to meet the standards of chemical, medical and industrial applications. There are both public and private organizations, which deal with water safety and provide useful information, relevant to drinking water issue. Depending upon the water quality, contaminants present in the water sample and amount to be treated, the methods of purification vary. Say for example, if the sample to be treated is unusual colored or muddy, it should be filtered first through clean cloths, or allowed to settle down for some time. Then, the actual process of treatment follows. In contrary to this, clear water can be purified directly without the filtration or sedimentation step. So, to get a brief idea about the pollutants that need removal and purification method to be adopted, a water test can be done beforehand. Boiling Method Boiling is the simplest way of purifying water. It disinfects water and kills disease-causing microorganisms such as E. To be on the safer side, it is recommended to boil drinking water for a few minutes for drinking. Filtration Method Here, contaminants are physically removed using a filter. Drinking water filters differ from normal water filters. The size of contaminants getting filtered depends on the pore size of filters, thus the filtrate can be small bacteria 0. It is expensive and even a micro-crack in the medium allows passage of unfiltered water. After filtration, it is always recommended to disinfect by using chemicals or ultraviolet light. Thus, according to many people, water ionizers and reverse osmosis are better options than water filters. Chemical Treatments Chemical treatment is an important method of drinking water purification. Over here, water is treated by using chemical halogens in specific amounts, and the most commonly used ones are chlorine and iodine. The effectiveness of this technique depends on the temperature of water, its turbidity, chemical concentration and the contact time. Note that both chlorine and iodine are not effective against Cyclospora, a diarrhea causing protozoa. Taste of the resulting water is altered after using the chemicals. Flavor kits are available in the market for retaining normal water taste. But, these kits should be added only after the contact time is over, otherwise it will precipitate the halogen. Chlorine in the form of bleach is used

for disinfecting drinking water. The amount of chlorine to be added depends on the concentration. The major drawback with chlorine treatment is the change in flavor. Also, study has found out that chlorine is not effective against Giardia. As compared to chlorine, iodine is more reliable for disinfecting drinking water. Iodine is available in the form of crystals, tablets and in solution form. It kills almost all the disease-causing microorganisms. The con side is change in taste. It is advised not to use iodine for pregnant women and for those who are allergic to iodine. Ultraviolet Purification Ultraviolet water disinfection is the most effective and fast water purification methods. The ultraviolet light inactivates the microbes by destroying their DNA Deoxyribonucleic Acid , thus preventing the microbes from reproducing. Ultraviolet radiation is effective against all sorts of microorganisms and also, it restores water composition and flavor. While on the con side, it is applicable only for less turbid water. The more suspended matter water has, the less effective will be ultraviolet purification method. It is because, the foreign particles disturb with the disinfection effect of UV light. Thus, for such a case, filtration or sedimentation should precede water purification. Other methods are reverse osmosis, using activated carbon filters, water deionizers and distillation. Combined techniques are implemented to get clean water. Drinking bottled water is just an approach to minimize waterborne diseases. Using packaged water is not an actual way of purifying water. It is treated and safe water that is packaged for consumption. In comparison to raw water that needs further purification, bottled water is ready-to-use water and hence very convenient. But the main drawback is its cost, not everybody can afford buying bottled water. Hence, knowing the ways to purify water and making it safe for drinking is a feasible approach in the long run. Storage of Drinking Water Besides adopting correct ways for obtaining potable water, storing pure water in clean containers is a prerequisite. The best choice of containers are food grade plastic or glass bottles with tight-fitting lids. Remember that, there is no use of treating drinking water, if it is kept in dirty containers. So, wash them with dish soap and hot water on a regular basis. And to disinfect them, a diluted, non-scented household chlorine can be used for rinsing. Never use these storage containers for keeping fruit juices, milk or other liquid foods. Otherwise, the food remains invite bacteria and microbes, which again lead to contamination of water. It is always better to prevent water pollution, instead of multiple processes for purifying it. Sewage runoff or the municipal waste is the main cause. Household wastes should be disposed to proper waste disposal sites, far away from the water sources. By making such small changes, we can protect the environment as well conserve clean water.

Chapter 3 : 5 Methods of Purifying Water Without Using Toxic Chemicals | Organic Survivalist Site

Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from water. The goal is to produce water fit for a specific purpose.

The water emerging from some deep ground water may have fallen as rain many tens, hundreds, or thousands of years ago. Soil and rock layers naturally filter the ground water to a high degree of clarity and often, it does not require additional treatment besides adding chlorine or chloramines as secondary disinfectants. Such water may emerge as springs, artesian springs , or may be extracted from boreholes or wells. Deep ground water is generally of very high bacteriological quality i. Depending on the strata through which the water has flowed, other ions may also be present including chloride , and bicarbonate. There may be a requirement to reduce the iron or manganese content of this water to make it acceptable for drinking, cooking, and laundry use. Primary disinfection may also be required. Where groundwater recharge is practiced a process in which river water is injected into an aquifer to store the water in times of plenty so that it is available in times of drought , the groundwater may require additional treatment depending on applicable state and federal regulations. Upland lakes and reservoirs: Typically located in the headwaters of river systems, upland reservoirs are usually sited above any human habitation and may be surrounded by a protective zone to restrict the opportunities for contamination. Bacteria and pathogen levels are usually low, but some bacteria, protozoa or algae will be present. Where uplands are forested or peaty, humic acids can colour the water. Many upland sources have low pH which require adjustment. Rivers , canals and low land reservoirs: Low land surface waters will have a significant bacterial load and may also contain algae, suspended solids and a variety of dissolved constituents. Atmospheric water generation is a new technology that can provide high quality drinking water by extracting water from the air by cooling the air and thus condensing water vapor. Rainwater harvesting or fog collection which collect water from the atmosphere can be used especially in areas with significant dry seasons and in areas which experience fog even when there is little rain. Freshwater bodies that are open to the atmosphere and are not designated as groundwater are termed surface waters. Treatment Goals The goals of the treatment are to remove unwanted constituents in the water and to make it safe to drink or fit for a specific purpose in industry or medical applications. Widely varied techniques are available to remove contaminants like fine solids, micro-organisms and some dissolved inorganic and organic materials, or environmental persistent pharmaceutical pollutants. The choice of method will depend on the quality of the water being treated, the cost of the treatment process and the quality standards expected of the processed water. The processes below are the ones commonly used in water purification plants. Some or most may not be used depending on the scale of the plant and quality of the raw source water. Pretreatment Pumping and containment â€" The majority of water must be pumped from its source or directed into pipes or holding tanks. To avoid adding contaminants to the water, this physical infrastructure must be made from appropriate materials and constructed so that accidental contamination does not occur. Screening see also screen filter â€" The first step in purifying surface water is to remove large debris such as sticks, leaves, rubbish and other large particles which may interfere with subsequent purification steps. Most deep groundwater does not need screening before other purification steps. Storage â€" Water from rivers may also be stored in bankside reservoirs for periods between a few days and many months to allow natural biological purification to take place. This is especially important if treatment is by slow sand filters. Storage reservoirs also provide a buffer against short periods of drought or to allow water supply to be maintained during transitory pollution incidents in the source river. Pre-chlorination â€" In many plants the incoming water was chlorinated to minimize the growth of fouling organisms on the pipe-work and tanks. Because of the potential adverse quality effects see chlorine below , this has largely been discontinued. Sea water can have pH values that range from 7. Fresh water can have widely ranging pH values depending on the geology of the drainage basin or aquifer and the influence of contaminant inputs acid rain. If the water is acidic lower than 7 , lime , soda ash , or sodium hydroxide can be added to raise the pH during water purification processes. Lime addition increases the calcium ion concentration, thus raising the water hardness. For highly acidic waters, forced draft degasifiers can be an effective way to raise the pH, by

stripping dissolved carbon dioxide from the water. Sufficient alkalinity also reduces the corrosiveness of water to iron pipes. Acid carbonic acid , hydrochloric acid or sulfuric acid may be added to alkaline waters in some circumstances to lower the pH. Alkaline water above pH 7. The ability of water to precipitate calcium carbonate to protect metal surfaces and reduce the likelihood of toxic metals being dissolved in water is a function of pH, mineral content, temperature, alkalinity and calcium concentration. Particles can be inorganic such as clay and silt or organic such as algae , bacteria , viruses , protozoa and natural organic matter. Inorganic and organic particles contribute to the turbidity and color of water. The addition of inorganic coagulants such as aluminum sulfate or alum or iron III salts such as iron III chloride cause several simultaneous chemical and physical interactions on and among the particles. Within seconds, negative charges on the particles are neutralized by inorganic coagulants. Also within seconds, metal hydroxide precipitates of the iron and aluminium ions begin to form. These precipitates combine into larger particles under natural processes such as Brownian motion and through induced mixing which is sometimes referred to as flocculation. Amorphous metal hydroxides are known as "floc". Large, amorphous aluminum and iron III hydroxides adsorb and enmesh particles in suspension and facilitate the removal of particles by subsequent processes of sedimentation and filtration. Iron III hydroxides can form over a larger pH range including pH levels lower than are effective for alum, typically: Where does coagulation end and flocculation begin? In water purification plants, there is usually a high energy, rapid mix unit process detention time in seconds whereby the coagulant chemicals are added followed by flocculation basins detention times range from 15 to 45 minutes where low energy inputs turn large paddles or other gentle mixing devices to enhance the formation of floc. In fact, coagulation and flocculation processes are ongoing once the metal salt coagulants are added. Synthetic organic polymers are high molecular weight compounds that carry negative, positive or neutral charges. When organic polymers are added to water with particulates, the high molecular weight compounds adsorb onto particle surfaces and through interparticle bridging coalesce with other particles to form floc. It is a large tank with low water velocities, allowing floc to settle to the bottom. The sedimentation basin is best located close to the flocculation basin so the transit between the two processes does not permit settlement or floc break up. Sedimentation basins may be rectangular, where water flows from end to end, or circular where flow is from the centre outward. Sedimentation basin outflow is typically over a weir so only a thin top layer of waterâ€”that furthest from the sludgeâ€”exits. In , Allen Hazen showed that the efficiency of a sedimentation process was a function of the particle settling velocity, the flow through the tank and the surface area of tank. Sedimentation tanks are typically designed within a range of overflow rates of 0. In general, sedimentation basin efficiency is not a function of detention time or depth of the basin. Although, basin depth must be sufficient so that water currents do not disturb the sludge and settled particle interactions are promoted. As particle concentrations in the settled water increase near the sludge surface on the bottom of the tank, settling velocities can increase due to collisions and agglomeration of particles. Typical detention times for sedimentation vary from 1. The amount of ground surface area occupied by a sedimentation basin with inclined plates or tubes can be far smaller than a conventional sedimentation basin. Sludge storage and removal As particles settle to the bottom of a sedimentation basin, a layer of sludge is formed on the floor of the tank which must be removed and treated. The amount of sludge generated is significant, often 3 to 5 percent of the total volume of water to be treated. The cost of treating and disposing of the sludge can impact the operating cost of a water treatment plant. The sedimentation basin may be equipped with mechanical cleaning devices that continually clean its bottom, or the basin can be periodically taken out of service and cleaned manually. Floc blanket clarifiers A subcategory of sedimentation is the removal of particulates by entrapment in a layer of suspended floc as the water is forced upward. The major advantage of floc blanket clarifiers is that they occupy a smaller footprint than conventional sedimentation. Disadvantages are that particle removal efficiency can be highly variable depending on changes in influent water quality and influent water flow rate. After coagulation and flocculation processes, water flows to DAF tanks where air diffusers on the tank bottom create fine bubbles that attach to floc resulting in a floating mass of concentrated floc. The floating floc blanket is removed from the surface and clarified water is withdrawn from the bottom of the DAF tank. Water supplies that are particularly vulnerable to unicellular algae blooms and supplies with low

turbidity and high colour often employ DAF. Rapid sand filters Cutaway view of a typical rapid sand filter The most common type of filter is a rapid sand filter. Water moves vertically through sand which often has a layer of activated carbon or anthracite coal above the sand. The top layer removes organic compounds, which contribute to taste and odour. The space between sand particles is larger than the smallest suspended particles, so simple filtration is not enough. Most particles pass through surface layers but are trapped in pore spaces or adhere to sand particles. Effective filtration extends into the depth of the filter. This property of the filter is key to its operation: Prior to this step, compressed air may be blown up through the bottom of the filter to break up the compacted filter media to aid the backwashing process; this is known as air scouring. This contaminated water can be disposed of, along with the sludge from the sedimentation basin, or it can be recycled by mixing with the raw water entering the plant although this is often considered poor practice since it re-introduces an elevated concentration of bacteria into the raw water. Some water treatment plants employ pressure filters. These work on the same principle as rapid gravity filters, differing in that the filter medium is enclosed in a steel vessel and the water is forced through it under pressure. Filters out much smaller particles than paper and sand filters can. Filters out virtually all particles larger than their specified pore sizes. They are quite thin and so liquids flow through them fairly rapidly. They are reasonably strong and so can withstand pressure differences across them of typically 2â€”5 atmospheres. They can be cleaned back flushed and reused. Slow sand filters may be used where there is sufficient land and space, as the water must be passed very slowly through the filters. These filters rely on biological treatment processes for their action rather than physical filtration. The filters are carefully constructed using graded layers of sand, with the coarsest sand, along with some gravel, at the bottom and finest sand at the top. Drains at the base convey treated water away for disinfection. Filtration depends on the development of a thin biological layer, called the zoogleal layer or Schmutzdecke , on the surface of the filter. An effective slow sand filter may remain in service for many weeks or even months if the pretreatment is well designed and produces water with a very low available nutrient level which physical methods of treatment rarely achieve. Very low nutrient levels allow water to be safely sent through distribution systems with very low disinfectant levels, thereby reducing consumer irritation over offensive levels of chlorine and chlorine by-products.

Chapter 4 : Common Methods of Water Purification and Disinfection at Home â€“ Purifier Advisors

Unfortunately, water purification tablets will not kill protozoa or remove chemical contaminants. Also, it takes 8 tablets to treat 1 gallon of water. And since a $5 - $10 bottle only has 50 tablets, it can get a bit expensive.

After completing this section you should be able to: Explain why water purification is important Purify water by boiling Purify water by chemically treating Purify water by filtering Purify water by zapping with ultraviolet light Explain the pros and cons of each purification method Explain why water purification is important How safe is the water? Telling you that water in the wilderness is safe to drink is not a risk most people are willing to take. To heighten our fear, there is a long list of completely invisible to the eye pathogens you would probably not want to put into your body, including various bacteria, parasites, and viruses. To make them even scarier, they have nasty sounding names like: Many of the symptoms from these ailments, such as diarrhea, take time to revel themselves. In fact, you may be well outside the wilderness before you even realize you have a problem. Although the risk of infection may or may not be exaggerated, the good news is there are plenty of water treatment options available which make following the safety advice relatively easy. Current water treatment options fall into four categories: Purify water by boiling Boiling The least expensive and most effective solution is boiling. Boiling will kill bacteria, parasites, and viruses. Many people advise bringing water to a hard boil for 5 minutes, and perhaps longer at higher elevation. More current literature, however, suggests merely reaching the boiling is sufficient and effective. The downside of boiling of course is inconvenience. To boil water you must set up a stove, consume fuel, wait for it to boil, and once boiled, wait some more for it to cool down so you can drink it. Boiling is probably a more practical approach when you are in camp for cooking anyway, but not as easy to deploy when traveling on the trail. Purify water by chemically treating Chemical Treatment Water can be effectively disinfected with Halogens, the most common being iodine and chlorine. Both are available in liquid or tablet form, and are very inexpensive and easy to carry. To be effective, however, you need to carefully follow the instructions, paying particular attention to the inter-relationship of the water clarity, water temperature, the concentration of the halogen, and the duration of treatment. If the water is cold or cloudy, you will have to increase either the concentration or the time of treatment. The most significant downside to halogens is the taste. This is particularly important when traveling with children. If the water tastes bad to them they will be far less likely to drink it, and the risk of dehydration will increase dramatically. After treatment not during , you may want to add flavorings to mask the taste, and increase consumption. Purify water by filtering Filtering By forcing water through very tiny pores say. Filters are not, however, typically effective against viruses. The main advantage with filtering, is that you can consume the filtered water immediately. Unlike chemicals, there is no waiting for treatment, and unlike boiling, the water remains as cool and refreshing as the source. The downside to filters is that they are heavier, bulkier, and more expensive than other solutions. Many find the convenience on the trail, clean taste well worth the cost and effort. If you are in an area where viruses are a concern, you will need to chemically treat the water after it is filtered. Purify water by zapping with ultraviolet light Ultraviolet Used for quite a while in commercial water treatment centers, the ultraviolet light technology has improved and streamlined to the point of being practical for outdoor enthusiasts. Small hand held devices, which can be carried on your belt, will effectively treat water directly in your water bottle in under 2 minutes. The device is also lighter, and less bulky than filters. One downside is that they are based on electronic technology, requiring an ongoing supply of batteries, and the device could be damaged in the field by dropping. I would not rely on a UV light as my only source of treatment, but it is very convenient for a few quick bottles along the trail. Because your preferred method may fail in the field pump break, UV device fizzle out, fuel not available, etc make sure you have a backup option. Many people carry Halogens as their back up treatment solution. Just ensue whatever methods you are counting on, you are well experience and familiar with using in the field. Water Purification Review You should be able to: Explain why water purification is important Purify water by boiling Purify water by chemically treating Purify water by filtering Purify water by zapping with ultraviolet light Explain the pros and cons of each purification method To review your skills, select the Water Purification Quiz:

Chapter 5 : Water purification - Wikipedia

How to Purify Water â€" Water Purification Process: boiling The simplest method to purify water is probably boiling. You need to bring the water to a full, rolling boil for at least five minutes to be safe, with some experts recommending an even longer time.

I will never give away, trade or sell your email address. You can unsubscribe at any time. You want a drink right now. So how can you get clean drinking water in a hurry? Here are the 8 fastest ways to purify water, starting with the slowest of the 8â€¦ 1. Household bleach Household bleach regular unscented can purify water in 30 minutes. Let it sit for half and hour, then sniff it. If you can smell a bit of chlorine, the water is ready to drink. If not, then repeat the process. Be sure to check the best by date on the bleach bottle before using this method because bleach begins to lose its potency after only 6 months. Also, it will not remove chemical contaminants or metals. Iodine Iodine is similar to household bleach except you need twice as many drops to purify the water. Iodine can sit on a shelf for a year without losing potency, as long as it is stored out of direct light. Anybody who is allergic to shellfish will likely be allergic to iodine. But either way, pregnant or nursing women are not advised to drink water treated with iodine. Unlike bleach, iodine can penetrate protozoan cysts. But despite its effectiveness, iodine is not a popular water purification choice due the strange taste, how expensive it is, and the other drawbacks mentioned above. And as with bleach, it takes about 30 minutes to purify water. Purification tablets Purification tablets are generally made with chlorine dioxide or iodine, with the latter less common. This means they also take about 30 minutes to purify water. Gently swirling the water will oxygenate it and make it taste a little better. The ones I linked to come with an extra bottle of tablets that neutralize the taste of iodine and remove the strange color. Unfortunately, water purification tablets will not kill protozoa or remove chemical contaminants. Also, it takes 8 tablets to treat 1 gallon of water. Boiling Water Boiling water is one of the most common ways to purify it. Depending on the amount of water you have and the type of fuel, you can have clean drinking water in about 10 minutes. You can speed up the process by covering the pot, which also keeps condensation inside it. The main drawback is that it takes time to use a camp stove or build a fire. Berkey water filters Berkey water filters are great, which is why I use one for my everyday drinking water. And although replacement filters are expensive, they last a very long time. The Berkey filter is one of the few filters that can remove the tiny viruses that may be lurking in your water. Viruses are extremely smallâ€"as small as. But with the Berkey you get sub-micron filtration so it removes In my opinion, this is a great investment. Katadyn filters Katadyn filters are similar to Berkey filters, only more portable. The Katadyn pocket water microfilter I linked to is pretty expensive, but it can filter out every microorganism larger than 0. Katadyn also makes a more affordable filter called the Vario water filter. As with the other filter, you have to use a pump mechanism. It can filter a half gallon and minute and a maximum of gallons before you have to replace it. The Lifestraw The Lifestraw is an amazing filter that cleans water as you suck it through. Just stick it in a stream or a puddle of water and take a drink. As the water travels through the straw, it also goes through the filter. You can filter over gallons of water with these filters before they need to be replaced. These devices use ultraviolet light to kill harmful pathogens in water. And there are some that can be charged through a USB port. Once the water is prefiltered, it only takes 90 seconds to purify it. And unlike the Katadyn and Lifestraw filters, this one kills viruses as well as bacteria and protozoa. The Steripen is definitely one of the best options if you need clean water quickly. There are many other water purification methods you should learn about, especially if you plan on spending any time in the wilderness. But these ideas should get you started.

Chapter 6 : 6 Natural Ways to Purify Your Water

Purify water by boiling Boiling. The least expensive and most effective solution is boiling. Boiling will kill bacteria, parasites, and viruses. Many people advise bringing water to a hard boil for 5 minutes, and perhaps longer at higher elevation.

A more apt statement for these times might be, "water, water everywhere, but is it safe to drink? Sadly, in this day and age there are few, if any, places where the water is safe to drink without treating, no matter how pristine and inviting it may look. Water in the wild often contains harmful microorganisms, bacteria and parasites that can cause a variety of ailments, such as giardia, dysentery, hepatitis, and hookworms. You need to bring the water to a full, rolling boil for at least five minutesto be safe, with some experts recommending an even longer time. The down side to boiling your drinking water is that it removes the oxygen and the water ends up tasting flat. You can improve its quality by pouring it back and forth between two containers to put oxygen back in, or simply shake it up. Iodine comes in either liquid form, which can be messy , or tablet form. One to two tablets or drops will clear up a quart of water. Shake your water bottle or container and wait twenty minutes before drinking. Water treated with iodine will have a darker color and a bit of an unpleasant flavor. Other chemical treatments to purify water that work similarly to iodine are chlorine tablets, potassium permanganate, or halazone tablets. You should be able to pick these up fairly cheaply at most outdoor stores. It is important when using chemical purification to make sure all surfaces have been decontaminated. After waiting the twenty minutes, slightly unscrew the lid of your water bottle or container and rinse around the threads and lid. The nice thing about using tablets is the container is very small and portable and can be slipped into a pocket, a plus if you do not want to carry a stove or pot, or take the time to boil water. Chemical treatment can be done on the hoof with minimal stopping time. These come in all shapes, sizes and price ranges. Most work by pushing the water through a charcoal or ceramic filter and then chemically treating it. Normally, they have one hose with a float that goes from the water source to the filter and a second hose, for clean water, that goes from filter to water bottle. When using this type of filter it is important to not cross contaminate the hoses. Keep the clean hose in a separate plastic bag so it never touches the contaminated hose. The plus side to this method of how to purify water is that there is no flat or funky flavor. Commercial filters are also good for when the water is on the murky or dirty side, as they will remove this also. The drawback is that the sediment or tannins that you are filtering out will quickly clog up the filter. Some can be cleaned, with others you need to buy a replacement filter. Like all technical equipment, cost and breakage are things to be considered. One is filtering through soil or, preferably, sand. Keep rinsing the water repeatedly through the sand until it is looking clear. A variation of this is to dig a hole near where the source is and use the water that filters through into the hole. Be aware, that although soil is a good filter for sediment and other particles, it is not a guarantee for things like bacteria. This is even true for spring water, which many people assume is safe to drink without treatment. Distilling is a method that can be used for either collecting water or gathering fresh water out of salt water. To collect water from the ground, dig a deep hole and place a collecting container or water bottle in the center. Cover the hole with a clear sheet of plastic. The plastic needs to be weighted in the center with a rock or heavy object so that it points down into the container. Then, secure the sides of the plastic tightly around the hole, such as by covering with dirt. The clear plastic acts like a greenhouse. The water in the soil evaporates as it heats up. When it hits the plastic it runs down to the point and drips off into the container. If all you have is salt water, you can distill it by placing a small pot inside a larger pot. The salty water goes in the larger pot but not the smaller one. Invert a lid over the pots that will point down into the smaller pot, then bring the water to a boil. As the water boils, fresh water will evaporate, hit the lid and drip down into the smaller pot, leaving the salt, or other minerals behind. For another primitive method of how to purify water, see our article on Boiling Water with Stones. Above all, be cautious and use common sense when choosing where to gather your water. Do the plants surrounding it look healthy? Are there dead animals near by that might have contaminated it? Generally, water that is further upstream will be cleaner than that downstream, but there are no guarantees. You can avoid picking up a lot of sediment by making sure you dunk

your water bottle completely under the water. This will avoid all the dirt and debris that floats on the surface. With so many ways to purify water, there should be something for everyone and no reason to ever take chances drinking untreated water. There are die-hards out there who will argue that the risk is small and not worth worrying about. But a nasty case of beaver fever in the back country can be not only uncomfortable, but life threatening. Diarrhea and vomiting can cause serious dehydration and sap your strength to the point that you can get yourself to safety. If you are going to spend time in the outdoors, always make sure you have at least one, if not two or more, methods for purifying water. Make sure you view our Giardia article to be aware of the hazards of water that has not been purified. Cathy Ellis is a teacher at Adirondack Wilderness Challenge, a wilderness adventure program for court adjudicated youth.

Chapter 7 : 8 Fastest Ways to Purify Water | Urban Survival Site

People consider the issue of water purification primarily for emergency situations but any water you drink these days (including even tap & bottled water) the question of whether or not it is pure clean water and safe to drink will come into play.

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Chapter 8 : How to purify water - Boil, Chemical, Filter, UV | www.nxgvision.com â„¢

How to Purify Water. Having access to clean water is vital for people, animals and plants. Water can be contaminated with pathogens, chemicals or other impurities that can cause illnesses and health problems.

So, you find yourself stranded in the wilderness. You are not sure where you are, or if anybody is searching for you. You start to look around and wonder what you should do to stay alive until a rescue party finds you. While it looks impressive to see survivalists build elaborate shelters or hunt for food on television, knowing water purification methods is one of the most important pieces to staying alive in this situation. These are food, water, fire, and shelter. You can survive three weeks without food, three days without water, and in some conditions only three hours without warmth from fire or shelter. Of course, you will want to build a fire or shelter quickly. However, you must stay hydrated to complete the arduous work required for these tasks. In some climates you can become severely dehydrated in just an hour or two if you do not hydrate. In my very first survival experience, I started working on a shelter around 10am. By 3pm my arms were cramping up from dehydration and I could no longer work. Unfortunately, salt water is not potable and most of the fresh water on the planet is teeming with bacteria and parasites. Water must be purified in order to drink it safely. While there are situations in which it is better to drink tainted water than to die from dehydration, it should be avoided whenever possible. Drinking dirty water can give you all kinds of waterborne illnesses that cause nausea, fever, vomiting, weakness, and diarrhea. All of this can leave you more dehydrated than you would have been in the first place. In addition, some of these illnesses can become life threatening. It is simply not worth the risk when the water purification process can be so simple. You just need to have a little knowledge and a few supplies with you before you ever head out into the wilderness. What water should I drink? Unfortunately, not all water is created equal. You will have some choices in a wilderness survival scenario, so pick the water that is going to be of the best quality before purification. Salt water is off limits. The salt content in sea water is high enough that it causes further dehydration, hallucinations, and eventually death. As for fresh water, follow the terrain downhill until you see creeks, rivers, ponds, or lakes. Running water is always your best bet as standing water allows for more growth of pathogens. Of course, springs and runoff from rain are your cleanest sources of water. In some cases, you can even drink these without purification. However, most water needs to be purified. If you do not have a body of water, you can dig a well at a low spot or dry creek bed where water may have once been. Killing pathogens versus removing debris There are two primary ways that you can purify water. You can eliminate the bacteria and parasites in the water, and you can filter out any dirt or sediment in the water. When pulling water from the wilderness, it is a good idea to do both. In this article, we are going to cover methods to accomplish both tasks. Understand that you can pick one method if needed, but your best bet is to combine these methods to get your water as clean as possible. Boiling Water for Purification Boiling is one of the oldest and most effective ways to kill pathogens in drinking water. Bacteria and parasites cannot stand the heat of boiling water, so even bringing water to a roaring boil for a few moments can make it safe to drink. I try to boil my water whenever possible, but there are disadvantages to this water purification method. One is that you must have some kind of container for your water. It works great if you have a pot or coconut shell, but not so great otherwise. Another issue is that you must have fire to boil your water. While sometimes fire comes easy in a wilderness survival scenario, often you will not have the tools needed to get a fire going quickly. Even if you do have fire and a container, your container may not be able to withstand the heat of the fire. It could melt or even catch fire. One way to get around this issue is the hot rock method. Put dry stones in the fire and let them get red hot. Then move them to your container filled with water. The water will boil from contact with the rocks, but the container will not catch fire or melt. Never put wet rocks in a fire as they will explode as steam tries to escape. Another option is the suspension method. If you have a plastic bottle that cannot be set in the fire, you will need to suspend it over the fire. Build a tripod by lashing three sticks together all being about three feet long. Then use cordage to suspend the bottle from the center of the tripod over the center of the fire. You want the flames of the fire to be coming just short of the bottom of the bottle. It will start to melt and change shape but will not let the water spill into the fire. Be

sure to keep the lid off of your bottle until it cools. Water Purification Filters Filtering is another very effective way to purify water. The main function of filtering is to pulls out dirt and debris that can be found in water sources. However, the use of charcoal in many filters will also draw out much of the toxin and pathogen content as well. This is why the quality of your filter is vital to your survival. We can start with the best and easiest way to filter your water. That is to use a quality survival water filtering system. The smallest and most portable options are straw-style filters. These are small enough to fit in your pocket, and most will eliminate However, they require you to either have a container for your water or to get down on the ground to lie on your belly and drink. My personal favorite option is a filter bottle. These bottles allow you to carry water with you, and they filter just as effectively as a straw filter. You can use them in your EDC everyday carry kit as they look much like any other water bottle and can be taken to work or to the gym. They often have a rubber mouthpiece that is more forgiving than the mouthpiece on a straw filter. I like to fill mine with tap water before going on a hike and hook it on my belt. Then I know I can stop at any water source to refill once the tap water is gone. There are also large gravity filters that are built for large camps or groups. These have a big water bladder that holds several gallons above a tube and a filter. Gravity will pull the water down the tube and force it through the filter. They are not nearly as portable as the other options. Finally, you can make your own filter by layering gravel, sand, cloth, and charcoal in a container and running your water through the filter. This should draw out debris and most pathogens in the water. Amazon has all kinds of water filters.

Chapter 9 : Organisms involved in water purification - Wikipedia

Purifying drinking water involves removing any contaminants from water sources that may cause harm or that may put levels over the federally mandated levels set for certain chemicals and naturally occurring minerals.

Buy it now at Amazon. This material is provided by the author for educational use only and is not a substitute for specific training or experience. When going into outdoors it is your responsibility to have the proper knowledge, experience, and equipment to travel safely. This material may not be reproduced in any form for commercial or Internet publication without express written permission of the author. Water Purification Dipping your head into a cold mountain stream and taking a long refreshing drink is an experience that has basically vanished from the wilderness areas of America. With the increased use of the wilderness there has also been an increase in the amount of bacteriological contamination of backcountry water supplies. There are a variety of microscopic organisms that can contaminate water supplies and cause potentially serious, even fatal, illnesses among wilderness travelers. The major danger in the backcountry from these infections is fluid loss due to diarrhea and vomiting, which can lead to hypovolemic shock and possibly death see Diarrhea or Vomiting, page ; Fluid Electrolyte Replacement, page ; Shock, page In order to drink the water, you should be prepared to treat it. There are numerous methods of water purification, described below in order of effectiveness. Toxic Water Biologically contaminated water is water that contains microorganisms such as Giardia a common microorganism that, if not killed, leads to intestinal disorders , bacteria, or viruses that can lead to infections see Gastrointestinal Infections, page Toxic water sources contain chemical contamination from pesticide runoffs, mine tailings, and so on. Boiling, filtering, or chemically treating water can remove or kill microorganisms, but it will not remove chemical toxins. This is also the case when using a solar still see page Boiling Boiling is the most certain way of killing all microorganisms. To be extra safe, let the water boil rapidly for one minute, especially at higher altitudes since water boils at a lower temperature see page Chemical Purification There are two types of chemical treatment: There are a variety of products on the market, so follow the directions on the bottle. Be advised that many of the tablets have an expiration date and become ineffective after that point. Also, once the bottle has been opened, the tablets must be used within a certain period. When in doubt, buy a new bottle. Remember that chemical purification methods may only be partially effective, depending on the water temperature. General Chemical Treatment Procedures The effectiveness of all chemical treatment of water is related to the temperature, pH level, and clarity of the water. Cloudy water often requires higher concentrations of chemical to disinfect. If the water is cloudy or filled with large particles, strain it, using a cloth, before treatment. Large particles, if swallowed, may be purified only "on the outside. Splash some of the water with the chemical onto the lid and the threads of the water bottle so that all water areas are treated. The water should sit for at least 30 minutes after adding the chemical to allow purification to occur. If using tablets, let the water sit for 30 minutes after the tablet has dissolved. The colder the water, the less effective the chemical is as a purifying agent. You can place the water in the sun to warm it before treating. Chemically treated water can be made to taste better by pouring it back and forth between containers, after it has been adequately treated. Other methods include adding a pinch of salt per quart or adding flavorings e. Iodine Treatment Iodine is light sensitive and must always be stored in a dark bottle. Iodine has been shown to be more effect than chlorine-based treatments in inactivating Giardia cysts. Be aware that some people are allergic to iodine and cannot use it as a form of water purification. Persons with thyroid problems or on lithum, women over fifty, and pregnant women should consult their physician prior to using iodine for purification. Also, some people who are allergic to shellfish are also allergic to iodine. Generally, the procedure is as follows: Add 10 drops per quart when the water is cloudy. The solution will be ready for use in one hour. Add the number of capfuls per quart of water treated listed on the bottle, based on the temperature of the iodine solution. The particle trap prevents crystals from getting into the water being treated. It is important to note that you are using the iodine solution to treat the water, not the iodine crystals. The concentration of iodine in a crystal is poisonous and can burn tissue or eyes. Let the treated water stand for 30 minutes before drinking. The water can be warmed in the sun before treating or hot water can be added.

Refill the treatment bottle after use so that the solution will be ready one hour later. Crystals in the bottle make enough solution to treat about 2, quarts. Discard the bottle when empty. Potable Aqua This is an iodine tablet product. Chlorine Treatment Chlorine can be used for persons with iodine allergies or restrictions. Remember that water temperature, sediment level, and contact time are all elements in killing microorganisms in the water. Halazone is an example of a chlorine tablet product. Tricks of the Trail Backups Always have at least one backup method for water purification in case one fails. This can be any combination of methods. And I can always boil the water. If boiling is your backup method, make sure you have enough fuel. Fix the Taste Adding vitamin C about 50 milligrams to iodized water completely eliminates any taste or color of iodine. You must wait until the iodine has purified the water before adding the vitamin C. A water filter pumps water through a microscopic filter that is rated for a certain-size organism. The standard size rating is the micron the period at the end of this sentence is about microns. Depending on the micron rating of the filter, smaller organisms like viruses can pass through. Be cautious when selecting a filter. You should know what potential organisms you need to treat for. Common microorganisms and the filter size needed: