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MAKING WATER DRINKING WATER

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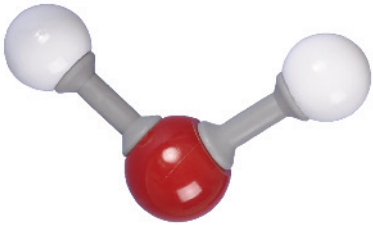
WATER GUIDE FOR SAFE DRINKING WATER

The oceans originated three billion years ago. Water is the oldest habitat on earth and is home to life forms that include everything from giant blue whales to microscopic single-celled oranisms. This Water Guide addresses microorganisms that can occur as pathogens in water.



Water is a tiny V-shaped molecule with the molecular formula H2O. The water molecule consists of two light hydrogen atoms (H) and a relatively heavy oxygen atom (O).

SAFE DRINKING WATER WHEN TRAVELING

No wonder traveling to faraway lands is becoming ever more popular. Getting to know foreign countries and new cultures expands our horizons, offers excitement and adds diversity in our lives. With increasing global mobility, it's simply becoming easier to reach remote regions of the world.

Traveling in foreign places demands excellent preparation that should also encompass health precautions. This is why getting solid advice regarding travel medicine before any trip is always advantageous. One of the most important health dangers in any locale comes from drinking contaminated, infected beverages. This is one area where one can gain greatly by using appropriate behavior and applying correct techniques.

The goal of this Water Guide is to provide information on drinking water when traveling and, in particular, to demonstrate practical and simple methods for water treatment and purification. With the correct knowledge, you can drastically decrease the risk of illness with just a few steps.

Enjoy your travels and return home healthy!

Tomas Jelinek M.D.

Internist, infectious disease specialist, tropical medicine physician

WATER EVERYWHERE, LITTLE TO DRINK

BLUE GOLD

97% OF THE WORLD'S WATER SUPPLIES ARE SALTY. TWO-THIRDS OF THE REMAINING 3% IS FROZEN SOLID IN THE POLAR ICE CAPS. A MERE 1% IS FRESH WATER, WHICH DOES NOT MEAN IT IS FIT FOR DRINKING.

The total freshwater supplies on earth are on a steady decline. Yet there must be enough to go round for an increasing number of humans. A little over half of the world's population has 36% of all existing water resources available.

According to a UNESCO study, two million tons of wastewater are dumped into the world's rivers and lakes each day. Severe overuse and clearing of ecologically important forests, intensive agriculture, countless infrastructures and the steady rise in tourism are having an enormous impact on the natural water balance and existing water resources. More than half of the world's major rivers are polluted or are running dry. Things are not better for many lakes and wetlands.

Each day, 5,500 million cubic meters (176 million cubic feet) of water are demanded throughout the world. This volume is indeed available; however, the problem is the geographical and seasonal distribution. Rain and other precipitation fall irregularly. The Pacific islands, India and Indonesia receive significant precipitation. On the other hand, rain in Sahara is all but inexistent.

In the future, new and complex technologies will contribute to the production of drinking water. Examples include seawater desalination and water extraction from the northern and southern polar ice caps.

Our wanderlust though takes us to places where water is in insufficient supply. Today, already one in five travelers visits tropical or subtropical areas. Often, they are not or only insufficiently aware of the water situation in the countries they are visiting. Although many travelers are familiar with the old saying to "boil it, peel it or forget it," they trust local water supplies as they would at home. Water quality is even quite critical in some large metropolitan cities.

TRAVELER'S DIARRHEA

On average, one in four travelers in distant lands is affected by diarrhea, with the rate in some areas reaching 80%. Travel plans often must be altered because of it. Normal traveler's diarrhea resolves itself in 3-4 days. But, time and time again, there are cases that require medical treatment upon returning home.

Good drinking water is clear, colorless, odorless and has a pleasant taste. According to international hygienic standards, it must be free of pathogens indicating the presence of human or animal waste. The total microorganism count must not exceed 100 per 100 milliliters (3.4 ounces). Drinking water is not pure water. It should contain minerals and salts vital to the human organism.

VARIOUS MICROCOSMS IN THE WATER

MICROORGANISMS

IN MANY POPULAR TRAVEL DESTINATIONS, MOST PEOPLE HAVE NO ACCESS TO PUBLIC WATER SUPPLIES. WATER FROM WELLS AND SPRINGS IS RARELY CHECKED FOR PATHOGENIC ACTIVITY. ESPECIALLY AMONG POORER AND RURAL POPULATIONS, SURFACE WATER ALSO OFTEN SERVES AS DRINKING WATER – WITH ALL OF THE RELATED HEALTH CONSEQUENCES.

The most common health risk when traveling is the infection by pathogens such as bacteria, viruses and protozoans contained in drinking water. Human or animal waste that has entered the water in different ways is the primary source of contaminants. Such contaminated water – when used for drinking, washing and cleaning vegetables – may rapidly lead to infections. According to the EU drinking water directive 98/83/EC, even water used for showering, laundry and dishwashing must be potable.

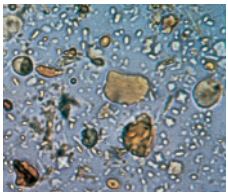
Drinking water contains three groups of pathogenic microorganisms.

Family	Known bacteria	Size range
Bacteria	E-coli (Escherichia coli), Salmonella (Salmonella typhimurium), Cholera (Vibrio cholerae)	0,2 – 5 µm
Viruses	Hepatitis A, Norwalk Virus, Rotavirus, Poliovirus	~0,02 – 0,2 µm
Protozoans	Amoeobiasis (Entamoeba histolytica), Giardia, Lamblia (Giardia intestinalis), Cryptosporidium (Cryptosporidium-parvum)	1 – 15 µm

A large number of additional pathogens are also known besides the microorganisms listed above. But according to WHO, their pathogenic (disease-inducing) action is only slight, or they are primarily absorbed along with food.

THREE FAMILIES OF PATHOGENIC MICROORGANISMS

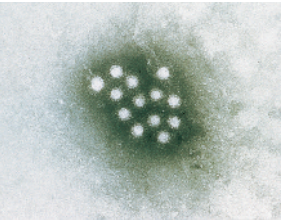
Bacteria – fast reproduction



Bacteria are single-celled organisms that reproduce rapidly in warm environments – especially water – depending on available nutrients. Some bacteria can divide in less than 10 minutes. Not all bacteria present health risks; however, as soon as they enter drinking water and combine with animal or human waste, things get risky. The water must then be chemically disinfected, or the microorganisms must be removed with microfilters.

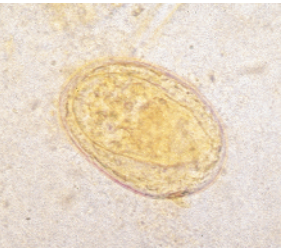
Viruses – minute parasites with unpleasant effects

Viruses can only reproduce within living cells because they have no metabolism of their own. Their tiny size makes it hard to filter them physically out of the water. For this purpose, filters with pore sizes smaller than 0.02 microns are necessary. But viruses are sensitive to heat and chemical purification. In turbid water, they are typically attached to particles and can therefore be all but completely removed by filters with pore sizes up to 0.2 µm. But to play it safe, it is still also advisable to purify the filtered water.



Protozoans – small but tenacious

Protozoans are single-celled animal organisms. They are more highly developed than bacteria, which can be seen by their size. Protozoans enter drinking water through animal and human waste. Until protozoans find a host, they encapsulate themselves in a membrane (cyst) that is highly resistant to environmental influences. To penetrate these cysts with chemicals, an extended contact time of up to four hours is required. On the other hand, due to their size, protozoans can be readily filtered out of water.



NATURAL, BUT STILL NOT HEALTHY

HEAVY METALS

HEAVY METALS OCCUR NATURALLY IN THE EARTH'S CRUST AND ENTER GROUNDWATER VIA RAINWATER THAT IS FILTERED BY ROCK LAYERS.

Heavy metals from groundwater may settle in the human organism. For this reason, the World Health Organization (WHO) has issued guidelines on the maximum allowable values in drinking water. In public drinking water treatment systems, these values are rigorously monitored. Heavy metals can only be removed from water by elaborate methods such as distillation or flocculation.

Far away from public drinking water supplies, women and young girls in Africa spend an average of three hours per day fetching water.

AGRICULTURAL AGENTS

AGRICULTURAL AGENTS SUCH AS HERBICIDES, PESTICIDES, OR MINERAL AND DUNG MANURE FERTILIZERS CAN ENTER GROUNDWATER. IF GROUNDWATER IS NOT TREATED, THESE SUBSTANCES WILL ULTIMATELY END UP IN DRINKING WATER.

Depending on the nature of the farmland, agents used in agriculture will be washed out quickly, to a greater or lesser extent, and enter groundwater or are flushed into surface water. Traces of DDT have even been detected in mountain lakes high above any agricultural activity. According to one study, the chemical DDT was introduced through rain that fell in the mountains and evaporated.

But most agrochemicals are an organic chemical compound and can be readily removed with activated carbon adsorption.

To grow a single orange in the Near East 50 liters (13 gallons) of water is required. The UNO has established the minimum water requirement per person per day as 20 liters (5.3 gallons). Upwards of 450 million people in 26 countries across the world do not have access to this minimum.

IN TURBID WATERS, GO FISHING BUT DON'T DRINK

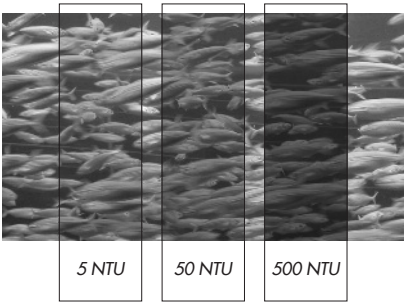
SUSPENDED SOLIDS AND TURBIDITY

WATER TURBIDITY IS CAUSED BY UNDISSOLVED PARTICLES, SO CALLED SUSPENDED SOLIDS. NORMALLY, THESE ARE HARMLESS SEDIMENTS.

Suspended solids are components in water that provide microbes with nutrients and thus promote their growth. Though normally harmless, they may prevent effective water purification. The disinfectant accumulates in these particles and is thereby "consumed" (chlorine consumption) or weakened. For this reason, the application of chemical disinfectants is limited to clear water. Turbid water must be filtered before treatment.

HOW TURBID IS TURBID?

Water turbidity is measured in Nephelometric Turbidity Units (NTU). According to the World Health Organization (WHO), tap water should have less than 1 NTU. The organization WHO states that water with a value of 5 NTU or higher is not fit for use as drinking water without filtering.



METHODS AND OPTIONS

CLEAN WATER KNOWLEDGE

BASICALLY, ANY WATER CAN BE TRANSFORMED INTO CLEAN DRINKING WATER. BUT TRAVELERS SHOULD KNOW THAT YOU CANNOT SIMPLY SCOOP IT UP FROM A GUTTER. DEPENDING ON THE TYPE AND DEGREE OF CONTAMINATION AS WELL AS LOCAL CONDITIONS, DIFFERENT TYPES OF WATER TREATMENT ARE AVAILABLE.

BOILING

Boiling is one of the oldest and most effective methods for purifying water. But it requires sufficient time, as well as energy in the form of wood, fuel or electricity. Boiling only eliminates microorganisms. Water will not become clear, and chemical substances will remain.

Various pathogens in water have different levels of heat sensitivity. Not all of them can be killed in the same length of time. To prevent traveler's diarrhea, water must be boiled for a specific period of time. Because you never know what microorganisms the water contains, it is best to base treatment on the most resistant pathogens. At sea level (0 meters), the boiling point of water is 100°C (212°F), and boiling it for five minutes is adequate. At 4,000 meters above sea level, the boiling point drops to 86.8°C (188°F). At this altitude, water must be boiled for 20 minutes.

How to treat diarrhea

Especially in warmer regions, if you get diarrhea it is important to replace lost fluids and electrolytes. This is best achieved using a mixture of electrolytes and sugar that is available in almost all countries. Other effective liquids include bouillon, fruit juices and lightly sweetened teas. An uncomplicated case of traveler's diarrhea can be helped with antidiarrheals. A doctor should be consulted if there is a fever, blood in the stool, or if diarrhea continues for several days without improvement.

PURIFICATION

Disinfectants (chemical agents) destroy microorganisms and thereby prevent the transmission of pathogens. In the treatment of drinking water, added substances and processes include: chlorine gas, chlorine, chlorine dioxide, iodine, ozone, silver and ultraviolet (UV) purification. Logically, these substances can only be used in water that is visually clear (see "Suspended Solids and Turbidity," page 13). Chlorine, iodine, silver and combinations thereof are sold as products for use during travel.

Chlorine is the water treatment most widely used worldwide. Its quick effect, good availability, ease of use and wide range of applications are its main advantages. In comparison to many other chemical disinfectants, however, chlorine does not have a long-acting effect. Water treated with chlorine will become contaminated again after lengthy storage.

Iodine, like chlorine, is in the halogen group of elements, but has a longer shelf life. For historical reasons – iodine was first used by the British and U.S. armies – it is mostly available in tablet form in English-speaking countries. A significant disadvantage of this disinfectant is its unpleasant taste. High iodine ingestion over several weeks may lead to serious hyperthyroidism. An activated carbon filter can be used to remove iodine after treatment. According to an EU regulation from October 2009, iodine is not longer permitted for use as a water treatment.

Silver, or rather silver ions, is one of the oldest methods for deactivating bacteria. Silver is slow-acting, but its result is long-term, preventing microbial growth for up to six months. Silver-based products are ideal for water storage in campers, RVs and on boats as well as for civil defense and disaster relief purposes.

Chlorine Dioxide, until recently , had to be produced as a gas with the aid of a generator. Now it can be made by adding a single tablet to water. The main advantages of chlorine dioxide are its effectiveness against all microorganisms, how quickly it takes action, and the independence of its pH value. Moreover, it is the only purification agent that is also effective in turbid water. Its only disadvantage is its higher price.

PRESERVATION

In public water systems, clean and treated drinking water is distributed through a networked pipeline to households. Water in this network is under high pressure, stays cold and is protected from light – an unfriendly environment for germs! Not so inside homes! There, water remains in pipes, and it is warmed continuously by a hot water heater, all of which promotes growth of microorganisms. If a water bottle is then filled with this water, it is exposed to daylight, and microorganisms can reproduce quickly.

Silver was used as far back as ancient Roman times to preserve water when traveling. When silver ions are added to treated water in the form of tablets or drops, it will be protected against recontamination in drinking bottles or water tanks for up to six months.

Clean water is also important for good hygiene. Better hygiene means decreased disease, plus increased development opportunities and improved prosperity.

ANTICHLOR

Many countries add chlorine to their tap water. This is a good solution for old pipes that might contaminate water. Its drawback is an unpleasant taste that travelers may be unaccustomed to. Instead of forcing people to plug their noses when brushing their teeth, it is possible to use antichlor agents, available in all pharmacies. It converts chlorine by means of thiosulphate into a salt, restoring the neutral taste to water.

MICROFILTRATION

Bacteria and protozoans are the most common microorganisms found in drinking water. To remove the most common bacteria from water, a microfilter with a pore size no larger than 0.3 microns is required. Possible filters include ceramics, fiberglass, plastics or activated carbon. Protozoans such as Giardia and Cryptosporidium are much larger (1 to 15 microns) and can be removed by microfilters with pore sizes up to 1 micron.

Microfilters are capable of mechanically removing bacteria and protozoans, whereas chemical processes destroy microorganisms but do not remove them from the water.

In mechanical filtration using a microfilter, the water always passes directly through the filter, while particles cannot move through the filter surface. The advantage of ceramic filters is that they can be cleaned and reused several times. The flexibility of fiberglass allows the entire filter structure to be folded, creating an extremely large surface area in a small space. Fiberglass filters therefore have a very high contaminant absorption capacity.

Safety first: Clean drinking water can be obtained from any stream or spring using a water filter bottle. Even in water-rich Central Europe, one should practice responsible use of the precious resource.

ACTIVATED CARBON (ADSORPTION)

Our environment is becoming increasingly polluted by organic and inorganic substances in the water, air and earth. Natural water sources always contain safe organic and inorganic substances. Humic acid, for example, is the primary organic component of soil and produces brownish water when it washes out of soil. Harmful substances such as herbicides and pesticides typically occur in water only in very small quantities. They are only removed when the safety limits are exceeded in order to prevent health problems.

Water is life as well as the source of health and well-being. More than 6,000 years ago, the first advanced cultures evolved in Mesopotamia, between the Tigris and Euphrates rivers. Their prosperity was based on an elaborate system of dams and waterways designed for irrigation and drainage.

All of these water pollutants can be removed by filtration using activated carbon. In this process, the substances to be removed come into contact with the activated carbon where they are adsorbed. Activated carbon is available either as loose granules or as pressed blocks. Carbon blocks have a much denser structure than carbon granules and therefore offer a larger contact area for adsorbing chemical contaminants. The amount of contaminants in the water will determine how slowly or quickly the surface of the activated carbon becomes saturated.

WATER SOFTENING (DECALCIFICATION)

Raindrops absorb carbon dioxide from the air, which dissolved in water becomes carbonic acid. This slightly acidic rain seeps into the soil and dissolves minerals from the rock such as calcium and magnesium. This is important for the human organism (for bones, the prevention of heart disease, etc.), but is not particularly appreciated when it shows up in homes as calcium residue (limescale).

Limescale (calcium) is most effectively counteracted using an ion exchange process. BRITA filters are a common example of this method. The filter cartridge contains small beads that are charged with salt ions. As water passes through the cartridge, the calcium and magnesium ions are exchanged with the salt ions. These filter cartridges are only designed to treat microbiologically safe water and will not eliminate any bacteria. They need to be replaced regularly to prevent bacteria growth inside. Filter pitchers should be stored in the refrigerator, where darkness and low temperatures inhibit bacteria growth.

SEA WATER DESALINATION

Water, water everywhere, but nothing to drink! – This is a common problem at sea. According to WHO, water is considered potable if it contains less than 1,000 ppm (parts per million) of salt per liter (quart). Seawater has an average salt content of 35,000 ppm.

It is easy to add salt to water, but much harder to then remove it.

With the presence of enough heat, salt water can be allowed to evaporate and be collected as condensed freshwater. Reverse osmosis is the process of forcing salt water under applied pressure through a thin, semi-permeable membrane that does not allow the undesirable minerals to pass through. Some life rafts are already equipped with a manual reverse osmosis system. They are designed to offer occupants enough water to survive. Due to their low output, however, they are not an option for travelers.

The desalination of seawater used to require a lot of energy. It was therefore usually only used on large ships. New methods now make desalination possible for use on recreational boats.

GLOBAL OVERVIEW

DIFFERENT COUNTRIES, DIFFERENT RISKS

THE PATHOGENS TO BE EXPECTED IN DRINKING WATER VARY AMONG COUNTRIES AND CONTINENTS. THE MAPS BELOW PROVIDE AN OVERVIEW OF THE GEOGRAPHIC OCCURENCE OF VARIOUS DISEASES THAT STEM FROM THESE PATHOGENS

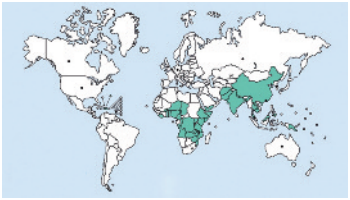
AGENT AND DISEASE

- Bacteria of fecal origin (cholera, typhoid fever, dysentery)
- Bacteria of non-fecal origin (Legionnaires' disease, leptospirosis)
- Protozoans (giardiasis, amoebic dysentery)
- Cryptosporidiosis
- Worms (bilharzia, schistosomiasis)
- Viruses (hepatitis A, hepatitis E, polio)

Cholera

Countries reporting outbreaks 2010 - 2011

• Countries reporting imported cases



Hepatitis A

Indicative risk assessment

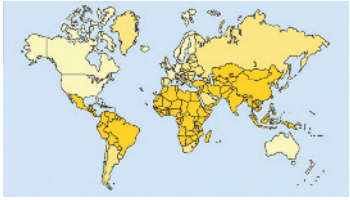
low

moderate

high

Risk criteria:

- HA-antibody prevalence
- Hygiene standards



Traveler's diarrhea

low risk: < 8%

moderate risk: 8 - 20%

high risk: 20 - 90%

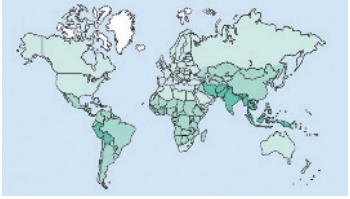
Typhoid fever

Occurences per 100,000

< 5

100 - 500

1,000



CONTAMINATED WATER MAKES YOU SICK

WHAT DOES WATER CONTAIN?

THE MOST COMMON CONSEQUENCE OF CONTAMINATED WATER IS DIARRHEA. BUT "CLASSIC" TRAVELER'S DIARRHEA IS NOT INESCAPABLE. SIMPLE PRECAUTIONARY MEASURES ARE POSSIBLE. WHAT IS IMPORTANT IS CLEAN DRINKING WATER. ALL WATER IS NOT EQUAL.

(NATURAL) MINERAL WATER

The term "natural mineral water" is controlled in Europe by various regulations. It must originate from underground water sources and be of original purity. Bottling must be done at the source itself. Bottled water must be officially approved. Natural bottled water may be either carbonated or non-carbonated.

FLAT WATER

The designation of "flat water" depends on the carbon dioxide content. Flat, or non-carbonated, water contains only little carbon dioxide or none at all. A distinction is made between three categories:

Natural mineral water: It is bottled from a clearly defined source and must contain a consistent quantity of minerals and trace elements. .

Spring water: It must originate from a defined source, but does not have to satisfy any criteria other than purity.

Drinking or table water: Is produced industrially from mineral, spring, tap or seawater. It must satisfy legal requirements, but its origin does not have to be specified. Table water is purified and mineralized. The goal is to standardize water that can be produced under a specific brand name at the same quality in several countries.

BOTTLED WATER

Bottled water is not a product of nature, but is artificially produced. It includes all types of water that companies can bottle and sell at any desired location. It may be mineral, spring or tap water that is either carbonated or not. Bottled water must meet certain quality standards depending on the specific country. It is allowed to be stored in cans, barrels or hoses. Today, this water is typically bottled in PET bottles. Bottled water is not guaranteed microorganism-free in every country.

Travel tip: Bacteria reproduce less quickly in carbonated water.

At the World Water Forum in Marseille, France, in March 2012, the availability of clean drinking water was declared a human right. There is a lack of ideas, however, as to how to make this a reality.

TAP WATER

Tap water comes from groundwater, surface water and spring water. It may have been exposed to numerous environmental factors. Legally, it can be treated with various chemicals. Depending on the age of the water system, it may contain traces of lead, copper and other metals. As a basic rule, never drink tap water in tropical and subtropical regions.

Travel tip: Even in good hotels in tropical and subtropical countries, one should never drink the tap water.

SURFACE WATER

Bizarre forms of life can be found in water. Aquatic creatures live in lakes, rivers and streams.

The term surface water refers to standing or flowing bodies of water. It is normally a mixture of groundwater and spring water or rainwater, although it may also contain wastewater. Streams, rivers and lakes may contain minerals in widely varying proportions. Because of the numerous organisms living in and around bodies of water, many organic substances, mostly metabolites, can be found in the water. Frequently, surface water is contaminated by heavy metals and organic compounds introduced from industrial plants and households. A very problematic source of contamination is also agriculture. This applies particularly when farming is not ecologically friendly. In addition to pesticides and herbicides, which often have active ingredients that contain halocarbons, large amounts of phosphate and nitrate (dung manure) and biological substances (liquid manure) may enter water from these sources. All surface water contains various bacteria, viruses and protozoans.

Travel tip: Always filter and/or purify water from rivers, streams, lakes, springs, wells and cisterns.

The water used for drinking is often the same water used for washing in the streams of small villages. With the right methods and products, even this water can be turned into safe drinking water.

HYGIENE TIPS WHEN TRAVELING

IN MANY COUNTRIES, HUMAN WASTE IS STILL USED AS FERTILIZER. CAREFUL AND THOROUGH HYGIENIC PRECAUTIONS ARE A MUST WHEN EATING OR DRINKING.

1. Ensure ice cubes are made from purified water; do not use any unless it is clear when you place the order where they have been made.
2. Avoid consuming open or non-industrially produced beverages.
3. Choose well-cooked foods; avoid raw foods and foods that have only been cooked or fried lightly, as well as seafood, mayonnaise, ice cream, butter, cream, etc.
4. Avoid food from street stands or mobile vendors.
5. Only eat fruits, raw vegetables and salads that have been cleaned with microorganism-free water; otherwise, clean them yourself with purified water.
6. Never drink fresh i.e. uncooked milk; only pasteurized milk is safe.
7. Only drink fruit juices if you are sure the juicer and the hands that have been in contact with the fruit are clean. Beware of bottled fruit juices that contain sugar, as this creates an ideal culture for bacterial growth.
8. Fresh, hot coffee and tea as well as beer and wine are safe. Caution: Alcoholic drinks will not destroy bacteria already ingested.
9. Always brush your teeth with purified water; even a gulp of contaminated water may lead to diarrhea.
10. Only take medication with purified water; diarrhea may affect effectiveness (e.g. pills).

11. Do not swim or bathe in tropical waters.
12. Wash your hands regularly, especially before handling food and after using the toilet.
13. Always use clean hand towels.

Fruit that you peel to eat is safe, for example citrus, bananas, pineapples, papayas and mangos.

DRINKING WATER IN A TOURIST PARADISE

TIPS FOR JOURNEYS TO FARAWAY DESTINATIONS

TROPICAL AND SUBTROPICAL TRAVEL DESTINATIONS ARE BECOMING INCREASINGLY POPULAR AND ARE NO LONGER JUST A PRIVILEGE FOR THE RICH AND FAMOUS. TODAY, EVEN FAMILIES HEAD ON TRIPS TO ASIA, AFRICA OR SOUTH AMERICA.

Instead of the well-known and classic holiday destinations of the Mediterranean, journeys to exotic lands are becoming increasingly popular. Often, the traditional winter skiing holiday is being replaced by trips to warmer regions. Countless travel specials to exotic destinations are available. But unlike trips to developed countries, such travel requires certain health precautions.

Much can be learned from travel guidebooks and websites – from typical country customs to the smart handling of local drinking water. Since you never know what is in the water, it is best to treat water yourself with your own water filter and purifying product. A medical consultation prior to travel is also advisable to avoid health issues.

Children too have a much more sensitive fluid balance than adults. Just one attack of diarrhea with vomiting could require on-site treatment.

TIPS FOR EXPEDITIONS

WILDERNESS CALLS. AS OUR DAILY LIVES BECOME MORE STRUCTURED, OUR URGE TO ESCAPE INCREASES.

Expeditions require careful preparation. This includes exact route planning, obtaining the necessary travel documents and official permits as well as choosing and buying the right equipment. First-aid kits are especially important. What they contain depends on where you are going. What definitely cannot be left behind are professional water filters and purification products for water treatment.

Even in untouched nature, it cannot be assumed water is clean. This is true even if the locals appear to be drinking water from wells or waterholes without suffering any harm. Their bodies have adapted to this water, and they have built up the necessary antibodies. Even in the high mountains, water must always be treated before consumption, since wild animals may excrete microorganisms that make humans sick (e.g. giardiasis). Boiling water is a very time-consuming process due to the lower boiling point at altitude.

For larger expeditions with more participants, it is advantageous not to treat drinking water daily, but rather to maintain a supply at base camp. Appropriate preservation methods allow treated drinking water to be stored for prolonged periods of time.

An expedition to the Torres del Paine can test your limits and be a good balance to structured daily life in the "civilized world."

DRINKING WATER FROM A PACK

TIPS FOR GLOBETROTTERS

THE BACKPACKING TRAVELER ISN'T THE SOURCE OF JOKES ANYMORE. IN FACT, BACKPACKS HAVE NOW BECOME AN ACCEPTABLE AND EVEN PRACTICAL PIECE OF LUGGAGE.

A loaded backpack should weigh no more than a quarter of your body weight; 10 to 15 kilograms (22 to 33 pounds) are ideal. With properly adjusted shoulder straps, the weight of a backpack will rest comfortably on your hips instead of your shoulders.

Once the route is set, outdoor shops can provide useful equipment tips. Water treatment products are an absolute must, even in the smallest of packs. Those who leave the beaten path and travel with a smaller budget need to be aware that where there is less comfort, there is usually poorer water quality. Travel preparation therefore always means having provisions for drinking water.

Yak tea is a matter of taste, but it is usually not a worry when it comes to bacteria.

PRACTICAL AND SAFE

TIPS FOR RECREATIONAL AND SHORT TRIPS

WHETHER IT'S A WEEKEND GETAWAY IN YOUR REGION OR A SHORT TRIP OUT OF THE COUNTRY, DRINKING WATER IS AN IMPORTANT PART OF TRAVEL PREPARATION.

RECREATION

The gurgling mountain stream normally looks very refreshing. But its water quality often leaves much to be desired. Streams and even spring water near pastures and fertilized fields may easily be contaminated, even in developed countries.

Travelers, mountain climbers and cyclists who – even in the most remote valley – drink straight from village fountains or from streams are risking their health. With each sip, they risk ingesting coliforms or enterococci (fecal streptococci). Even clear streams and lakes may be teeming with pathogens capable of transmitting serious diseases. The ideal alternative to lugging along safe water supplies is a water filter bottle that can purify water from any source along the way in no time at all.

Treat your own drinking water quickly and easily yourself without carrying heavy water bottles.

SHORT TRIPS

As travel opportunities become more varied, so too do trips become shorter. It is hardly surprising that when people plan short trips – often to exotic destinations – they often forget proper travel preparations. Just as important as sunscreen and swimsuits are water purification tablets because even in the best hotels, tap water in all countries is not always really microorganism-free.

A tourist paradise in an emerging or developing country can also mean contaminated drinking water.

ELIMINATING PATHOGENS

TIPS FOR CULTURAL AND ADVENTURE TRAVEL

THOSE WHO PREFER TRANQUILITY AND EXPERIENCING COUNTRIES, CULTURES AND PEOPLE OFTEN TRAVEL OFF THE BEATEN TRACK. EAGER FOR THE TRIP, THEY DEVOUR READING MATERIALS IN PREPARATION. BUT, ULTIMATELY, HEALTH ALSO DEMANDS A CERTAIN PRECAUTIONARY PREPARATION.

Safe drinking water is not always available on adventure travels in developing and emerging countries, especially on day excursions. Instead of relying on bottled water, which may not always be microorganism-free in all regions, you should take along your own bottles filled with previously filtered or purified water. This drinking water can be easily prepared from the tap water in your hotel.

Another practical solution for light daypacks is to carry disinfectants or antichlor with you. An even easier solution is to carry your own drinking water treatment system with you in the form of a water filter bottle. It will enable you to make safe drinking water immediately out of any clear water. And it does not weigh much more than a standard sport bottle.

Preparing your own drinking water is done easily on day trips from practically any water source.

DRINKING WATER HYGIENE IN EXTREME CONDITIONS

WATER IS LIFE

WHEN PUBLIC DISASTER STRIKES, DRINKING WATER SUPPLIES ARE SUDDENLY AT RISK. SUCH SITUATIONS CALL FOR SWIFT ACTION, BECAUSE WATER IS LIFE – AND COULD MEAN SURVIVAL.

Many reasons may limit or prevent the availability of public water supplies as a result of contaminated groundwater. Examples include natural disasters such as floods, landslides and tornados as well as human errors such as breakdowns or malfunctions, or even sabotage or war. In all of these situations, it is important to take precautions with regard to drinking water.

As a result of a water emergency, victims and their rescuers are exposed to an increased risk of contracting infectious diseases such as:

- Diarrhea from different viruses and bacteria
- Meningitis from viruses, and
- Other infectious diseases such as Hepatitis A and typhoid fever.

Drinking water is crucial in emergencies

- As a precaution, always boil water used for drinking and food preparation; this is especially important in preparing food for babies and infants.
- If the drinking water quality is questionable, treat water using microfilters or chemical disinfectants.
- You can use a conventional, unscented household bleach as an alternative to specific water treatments. To determine the correct dose of chlorine, check the concentration on the label (1% to 10%), and measure as follows:

Chlorine concentration	Drop per litre
1%	10
4 bis 6%	2
7 bis 10%	1

If the chlorine concentration is unknown, use 10 drops per liter (quart).

- Do not use water from springs or wells unless it has been treated with a quality microfilter or disinfectants.
- Once regular public water supplies have been restored, carefully clean all taps and let the water run for an extended time before drinking.

Russia and South America have the largest freshwater resources, but even in these regions, clean drinking water is becoming increasingly scarce.

GOOD THINGS TO KNOW ABOUT WATER

BLUE PLANET

- Our drinking water is not allowed to contain either coliforms or enterococci, and the total bacterial count is not allowed to exceed 100 per 100 milliliters (3.4 ounces). Good drinking water is colorless and odorless, and clear and free of harmful substances and microorganisms. But remember: Drinking water is not just water; it also contains minerals and salts.
- The human body requires approximately two liters (2.1 quarts) of fluids per day. We take in a little more than half of this in the form of liquids, and the balance as solid food. In warmer regions, the fluid requirement may be as high as six liters (6.3 quarts) per day.
- In many developing countries, farmers use untreated wastewater to irrigate their crops. The result: Bacteria, amoebas and viruses attack the crops and also often enter the water supply system.

- An increasing demand for meat (for example, in India, China, South Korea and Japan) is increasing the need for water. The production of one kilogram (2.2 pounds) of poultry meat requires almost four times more water than the production of one kilogram (2.2 pounds) of grain. Beef requires 10 times more water than grain.
- One in six people on our planet does not have access to clean drinking water. Five million people die every year as a result of inadequate water supplies. That is 10 times the number of people who die due to war. Children under the age of five are hit the hardest.
- Two billion women, men and children are affected by the lack of water worldwide – about one-third of the world population. It is likely that approximately two-thirds of the global population will not have access to clean drinking water by the year 2025.

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Alpine Water Test, 9/97

SVGW, Swiss Assocation of Gas and Water: www.svgw.ch

Survey of drinking water and water suppliers, SVGW 2001

VDM, Verband Deutscher Mineralbrunnen: www.mineralwasser.com

National Reference Center for Salmonella, Robert Koch Institute/Wernigerode, Department of Epidemiology, Robert Koch Institue Berlin

Center for Travel Medicine: www.crm.de

Additional other sources

LINKS

www.katadyn.com

INFORMATION ABOUT DRINKING WATER

www.drinking-water.org

www.thewaterpage.com

STAY HEALTHY WHILE TRAVELING

www.traveldoctor.co.uk
www.cdc.gov/travel
www.travelmedicine.com

GOVERNMENT SITES

www.epa.gov (U.S. Environmental Protection Agency)

www.bwg.admin.ch (Swiss Federal Office for Water and Geology/ Switzerland)

INTERNATIONAL ORGANIZATIONS

www.who.int

www.unesco.org

FOR MORE INFORMATION PLEASE CONTACT THE BCRT- BERLINER CENTRUM FÜR REISE- UND TROPENMEDIZIN (CENTER FOR TRAVEL AND TROPICAL MEDICINE BERLIN)

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This water guide creates awareness of and offers solutions to water needs during travel. Katadyn is the worldwide leader in portable water treatment.

NOTE

Not all products in this brochure are available in all areas. Likewise, some areas offer products not in this brochure. Please visit www.katadyn.com to see which products are available in your region.

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