



Hydration needs safe water



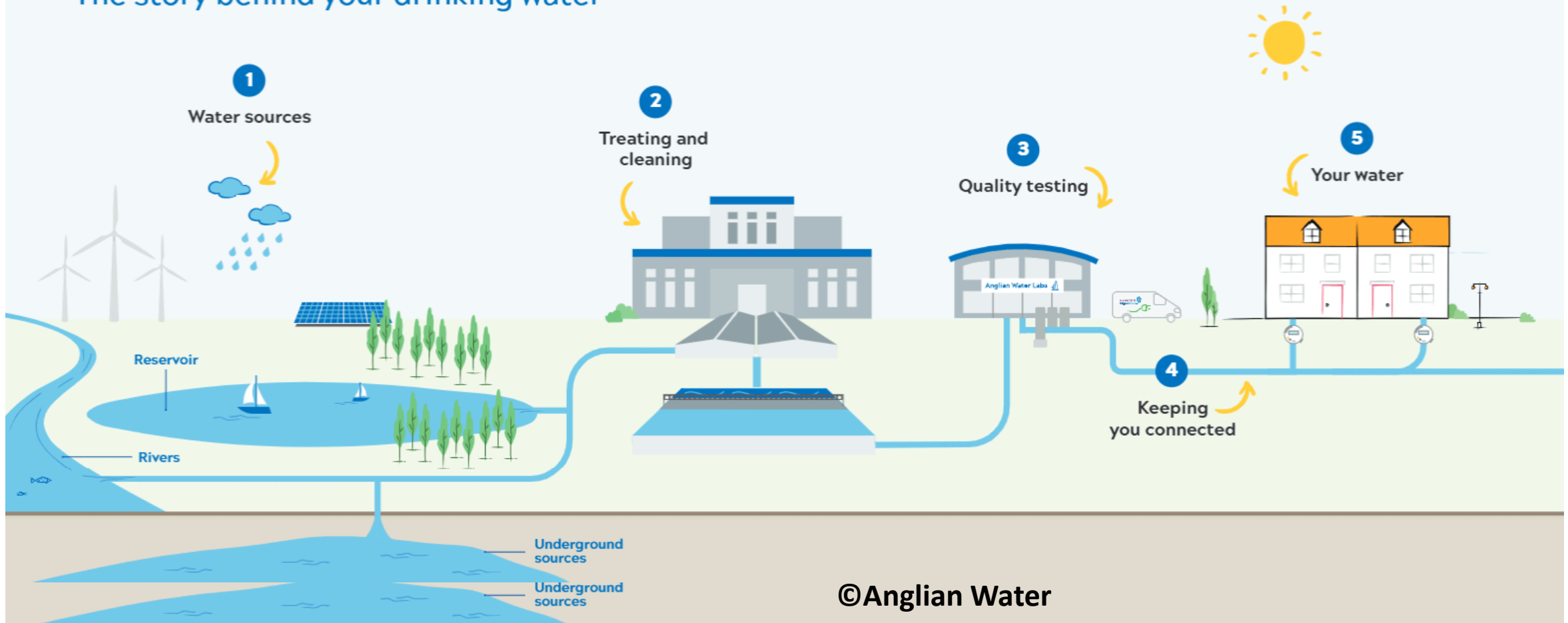
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Where do we get our water from

The story behind your drinking water



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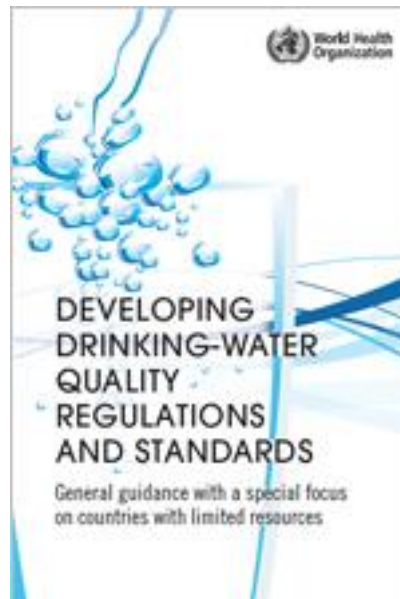


Available, Accessible and Affordable Safe Water is Vital

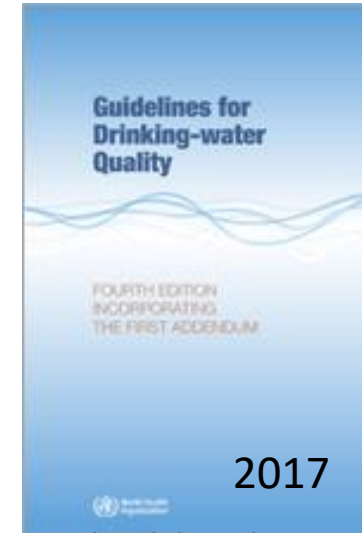
- Water as delivered to the building in high income countries is of a very high quality.
- Water contains a number of inorganic constituents and sometimes contaminants depending on the source of the water.
- Drinking water can also contain trace concentrations of organic contaminants.
- Water is not sterile but faecal pathogens are removed in treatment. Unusually there can be post-treatment contamination.
- Water quality can change in buildings. Management of water distribution in buildings is very important.

WHO Guidelines for Drinking-water Quality

Guidelines for 86 chemicals



First edition 1984, before that International Standards for Drinking-water. WHO do not set standards but the Guidelines are the scientific point of departure for developing national standards.



Second addendum published. Fifth edition planning started



Regulations

- UK regulations include the standards for individual parameters.
- They include a wide range of other issues like the requirement to only use approved materials and chemicals.
- The regulations in the UK are legally binding and prosecutions do follow infringements.
- Standards follow the previous drinking water directive (pre-Brexit) and the WHO Guidelines on drinking water quality.
- Not only do the regs cover standards but also sampling requirements and the quality assurance of analytical techniques. (Independent Audit)
- Private supplies are also covered but enforced through Environmental Health.



Microbial Pathogens – Bacteria, Viruses, Protozoa

- Remain the greatest risk. Essentially acute, and infective dose often very small.
- An infected individual can excrete many organisms, particularly viruses. Example of Norovirus- 10^5 – 10^{11} particles/stool, 10^2 – 10^8 /L wastewater.
- Fortunately we are good at removing particles and in the UK we have a multibarrier approach to ensuring microbial safety of drinking water.
- Coagulation, filtration with various media or membranes and disinfection with chlorine or UV (mostly for groundwater).
- Monitoring we use surrogates; *E coli* (0 in 100 ml), but also operational controls such as turbidity.
- Tap water is not sterile but is pathogen free to the point at which water enters buildings and enteric pathogen free to the tap.
- Rare contamination incidents mostly due to ingress into the distribution system.



Buildings

- Distribution systems in buildings can be a problem but not usually for ingestion, BUT cross contamination does occur and cold water storage tanks can be problematical.
- *Legionella* is a significant respiratory pathogen, particularly in vulnerable populations.
- *Pseudomonas aeruginosa* is a wound pathogen.
- Both can grow in building distribution systems so these need to be managed to minimise risk.
- Warmer temperatures will increase the risk of pathogens such as *Legionella* and *Pseudomonas aeruginosa* in distribution systems in buildings.
- Contamination after water has been drawn from the tap is generally a low risk and is easy to prevent. Just requires thought and continued awareness.
- A number of failures of the microbiological standard occur each year due to contamination of taps. Very easy to avoid by using common sense and designated potable water taps.



Chemical contaminants

- Differ from pathogens, unlikely to cause any adverse effects except following long-term exposure, exceptions like copper from plumbing.
- Only a small number have been shown to actually cause adverse effects through drinking water – arsenic, fluoride, nitrate, lead. Possibly chlorination by-products, manganese.
- Significant margins of safety or negligible risk used in developing guideline values and standards. Move for more precaution but.....
- Important considerations:
 - Small differences in standards can make a huge practical/cost difference while delivering no benefit to health.
 - Treatment can be very challenging.
 - Monitoring/surveillance can be costly and difficult, need routine and available methods.
- All adds cost and drinking water needs to be affordable.
- **Advanced treatment is almost invariably energy hungry so bigger carbon footprint.**



Chemicals

- We have tight standards and these are adhered to. Constantly reviewed by WHO and regulators.
- Fluoride – must meet the current standard of 1.5.mg/L. In the UK there are some areas with natural fluoride. Where fluoride addition is practiced the same standard applies. The concentration added is up to 1.0 mg/L. In the USA and Canada the concentration added is an average of 0.7 mg/L.
- Chlorine, chlorine-based disinfectants. Trace levels at the tap – higher concentrations can cause taste problems for some people, that can impact on perception.
- Chlorination by-products based on indicator group parameters but on a par with international values. Now the England and Wales requirement is as low as reasonably practical.
- Lead – comes from service connections (being steadily replaced) and internal plumbing. The WHO guideline value of 10 µg/L is no longer health-based as no IDENTIFIABLE threshold. Infants and children are the most vulnerable groups. Concentration depends on contact time with the lead and is not necessarily a measure of exposure.
- Not just from lead pipes but also high lead copper alloy fittings and lead solder. Need to ensure that any plumbing jobs in hospitals or care homes etc. are carried out to the proper standards.



Summary

- Good hydration is vital but drinking water needs to be safe and affordable.
- Safety means free from microbial pathogens and from high levels of chemical contaminants such as lead.
- We need to make sure that water distribution systems in buildings are properly managed and safe materials and practices implemented.
- Essential for preventing pathogens and chemical contaminants such as lead and contaminants from coatings and other materials.
- Important for protecting vulnerable groups and delivering convenient and safe water for adequate hydration.