DANAMARK WATERCARE

intro to water

DanaHub Presentation

key topics

Fun Facts on Water
The Life Cycle of Water
Water Characteristics
How Water Impacts Foodservice
Understanding Solutions
Recap

fun facts about water

Nearly 97% of the world’s water is salty i.e. undrinkable

Less than 1% of municipally treated water is consumed

If we flushed our toilet one less time per day, we would save a lake full of water 1 x mile long x 1 x mile wide x four ft deep every day

Every glass of water served in a restaurant requires two glasses of water to clean that glass

Little leaks add up. A faucet drip of 2 tbsp. a minute comes to 15 gals. a day, 105 gals a wk.

fun facts about water - cont'd...

Running the water while shaving waste more water than what one person needs for drinking water for a week

It takes 215,000 litres of water to produce just one metric tonne of steel

Almost 70% of the world’s freshwater withdrawals are used for agriculture

There is no such thing as 'new water' on planet Earth.

The water you are drinking today could be the same water that Cleopatra bathed in!

the life cycle of water

Of all the water that exists on our planet, less than 3% is freshwater.

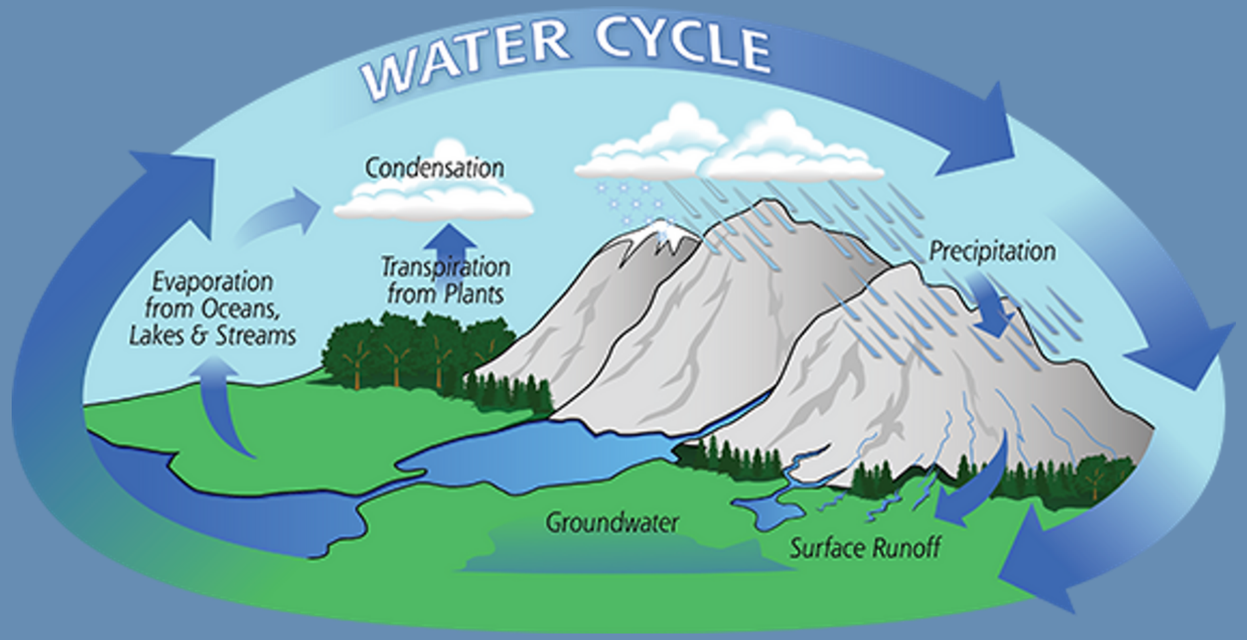
Most of this freshwater is frozen in glaciers, ice caps, or is deep underground in aquifers.

water is always on the move...

Rain falling today may have been water in a distant ocean days before. And the water you see in a river or stream may have been snow on a high mountaintop.

Water is in the atmosphere, on the land, in the ocean, and underground. It moves from place to place through the water cycle.

the hydrological cycle



Water, the main reason for life on earth, continuously circulates through one of earth's most powerful systems; the hydrological water cycle.

Earth's water is finite, meaning that the amount of water in, on and above our planet does not increase or decrease.

A drop of water may spend over 3,000 years in the ocean before evaporating into the air, while a drop of water spends an average of just nine days in the atmosphere before falling back to Earth.

As it moves through the water cycle, water often changes from a liquid, to a solid (ice), to a gas (water vapour).

Water in oceans and lakes is typically liquid; but it is solid ice in glaciers, and often invisible water vapour in the atmosphere.

Clouds are tiny droplets of liquid water or small ice crystals.

a global view

Understanding the role of precipitation in Earth's water cycle and how it interacts with other Earth systems requires a global view. The distribution of water throughout the atmosphere and how it moves, changing from a solid, liquid and gaseous form influences the behavior of the planet's weather and climate.

While population and demand on freshwater resources are increasing, supply will always remain constant. And although it's true that the water cycle continuously returns water to Earth, it is not always returned to the same place, or in the same quantity and quality.

consumption...

1%

Estimates vary but on average only 1% of the water that is treated so that it is safe to drink, it actually consumed.

3,000 GALLONS

The water industry estimates that the average person uses 3,000 gallons of water monthly for bathing, cooking, washing, recreation and watering.

70%

Globally, over 70% of freshwater is used for agriculture.

The agricultural sector is by far the biggest user of freshwater. In Africa and Asia, an estimated 85-90% of all fresh water used is for agriculture. According to estimates for the year 2000, agriculture accounted for 67% of the world's total freshwater withdrawal, and 86% of its consumption.

water characteristics

Water is called the 'universal solvent' because it is capable of dissolving more substances than any other liquid.

This is important to every living thing on earth. It means that wherever water goes, either through the air, the ground, or through our bodies, it takes along valuable chemicals, minerals and nutrients.

examples of water characteristics

alkalinity

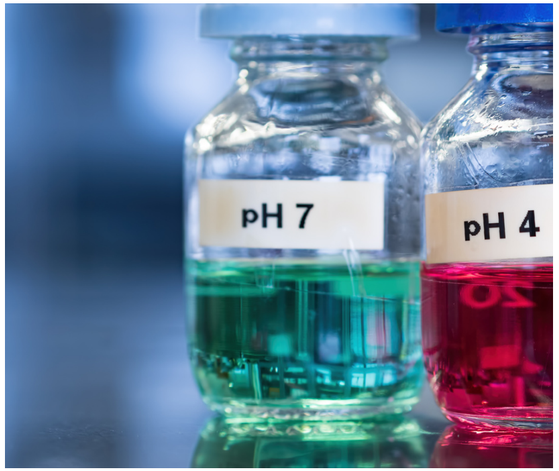
Alkalinity is water's capacity to neutralize acid. Some alkalinity is desirable to react with acids but too much has a negative effect on taste and contributes to scale buildup.

hardness

All water supplies, regardless of source, contain some amount of total dissolved solids (TDS) and that includes minerals that form into scale.

turbidity

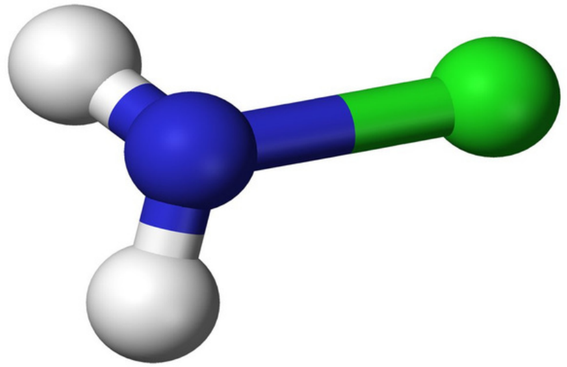
Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air.



pH

Water's balance of acid and alkaline substances can be an indication of whether it will be scale-forming or corrosive.

and then there's the stuff we add to water to make it safe...



chlorine **chloramines**

All municipal water supplies are disinfected with either chlorine or chlorine and ammonia (chloramines). Chloramines are secondary disinfectants that are added to the water supplies of some municipalities in Canada to provide longer disinfection in the distribution piping than chlorine.

how water impacts foodservice

hardness

Scale Build-up acts as insulation on heating elements - 1/4” Scale = 39% increased energy consumption. This rock-like buildup leads to reduced performance, increased energy consumption and costly downtime for maintenance.

chloramines

With fountain beverage it bubbles out with the CO2 causing odour problems. It reacts with sweeteners to form compounds that can amplify chlorine and ammonia taste and odours.

chlorine

When water containing high levels of oxygen, chlorine, chloramine, chlorides (or other acidic conditions) is heated, the resulting gases can be corrosive. These same contaminants can also create taste problems or a bitter after-taste.

turbidity

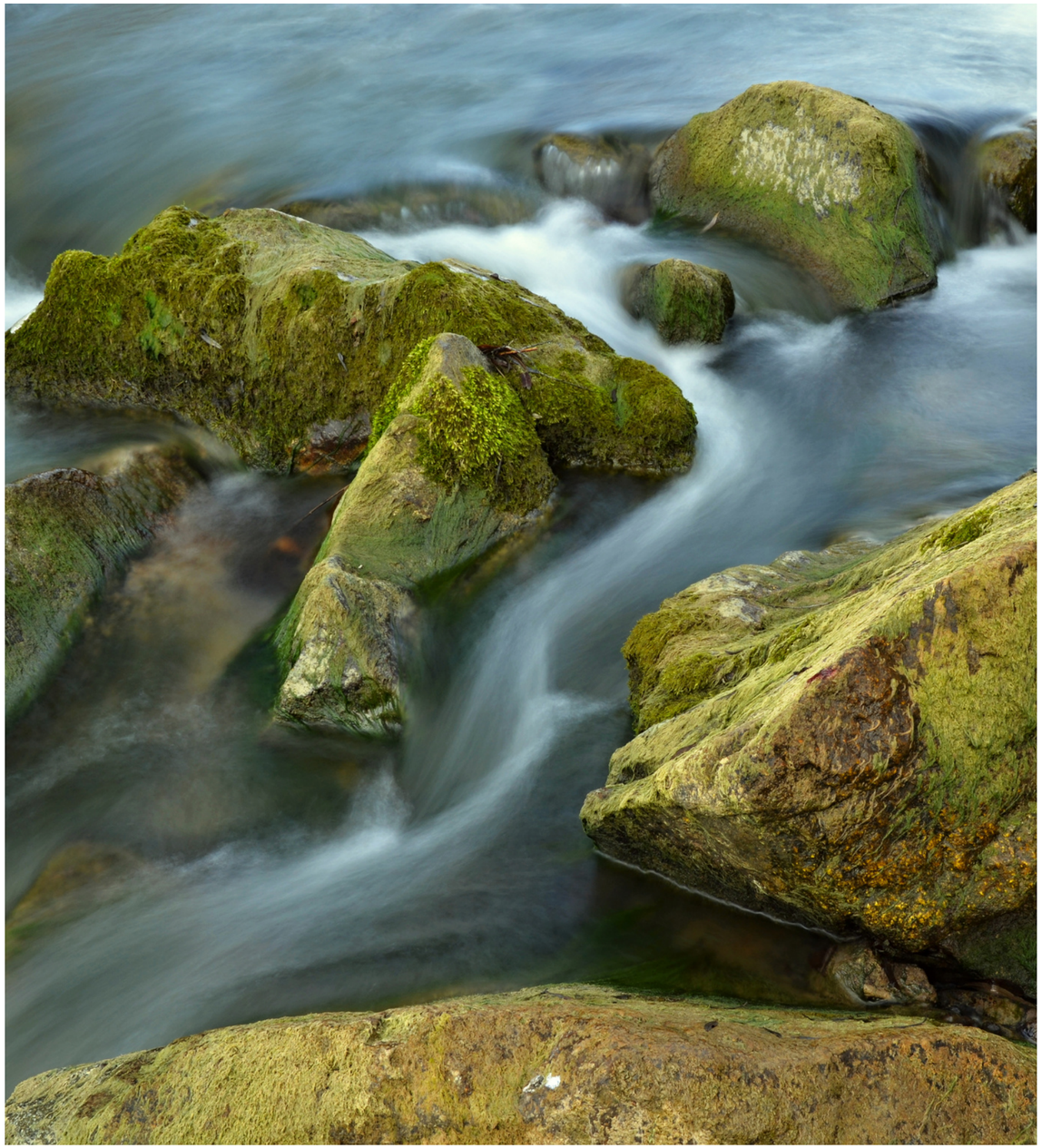
Turbid water cannot be properly disinfected for drinking water. Excessive turbidity often triggers a boil water advisory as the water is too cloudy to accurately test for the presence of parasitic cysts.

hardness

where does it come from?

Hard water is formed when water percolates through deposits of limestone, which is largely made up of calcium and magnesium carbonates, bicarbonates and sulfates.

Think of scale as simply dissolved rock. Think of a stream. Over the centuries, water has been dissolving rock formations as it flows down a stream.



hardness

how does it form?

Mother nature being who she is, these dissolved minerals want to return to their natural state. They just need a little help; a catalyst!

That catalyst is temperature. Once you heat water up or freeze it; those dissolved minerals come out of solution.

Add a few particles of dirt, which are always present in water, and we have a perfect storm.

hardness classifications

Hardness Level	Total Hardness(in parts per million)	Total hardness(in grains per gallon)
Soft Water	0 to 60 ppm	0.0 to 3.5 gpg
Medium Hard	60 to 120 ppm	3.5 to 7.0 gpg
Hard Water	120 to 180 ppm	7.0 to 10.5 gpg
Very hard	Above 180 ppm	Above 10.5 gpg

The Effect of Scale Build-Up on Energy Consumption

Energy consumption accounts for 2%-3% of a restaurant's total operating costs (NRA).

Scale acts as an insulator in water heaters and steamers, increasing energy use.

Let's now take a look at turbidity and dirt...

Thickness of scale in inches	Loss of efficiency	Gas Wasted per 1000 cubic feet
1/64"	4%	40 cu. ft.
1/32"	7%	70 cu. ft.
1/16"	11%	110 cu. ft.
1/8"	18%	180 cu. ft.
3/16"	27%	270 cu. ft.
1/4"	38%	380 cu. ft.
3/8"	48%	480 cu. ft.
1/2"	60%	600 cu. ft.
5/8"	74%	740 cu. ft.
3/4"	90%	900 cu. ft.

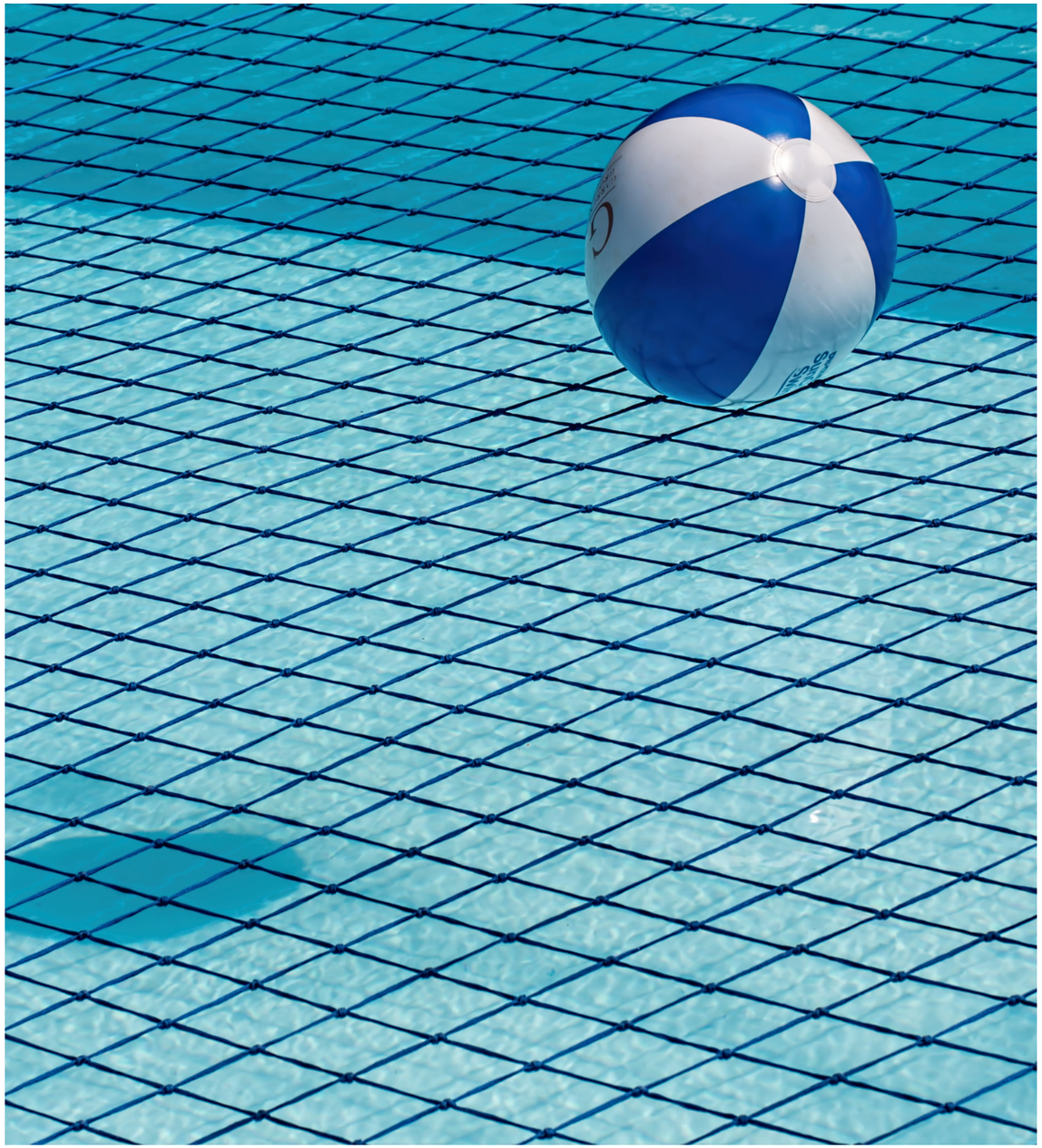
how dirt contributes to scale

Up to 40% of the mass of scale can be dirt. Dirt is the nucleus, or the starting point. As dissolved calcium and magnesium come out of solution, they need something to stick too, which is where dirt particles come in. The scale then continues to form like a snow ball rolling down a hill.

chlorine

what are the negative effects?

- cheap and effective
- adds a distinctive smell
- can be very corrosive to metals
- the amount of chlorine can vary day to day
- sometimes a water supply will be “shocked” to reduce bacterial residue



Chloramines

- a combination of chlorine & ammonia
- more effective & cheaper for municipalities than chlorine
- causes damage to seals, gaskets & O-rings
- can increase corrosion & amplify off-tastes & odours
- can dramatically affect the taste of fountain pop drinks

chlorine verses chloramines

why are municipalities switching?

It doesn’t dissipate as readily as chlorine gas, so it provides disinfection to the far ends of the municipal pipe lines.

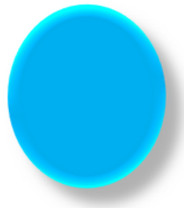
Chlorine reacts with naturally occurring organics to create unwanted byproducts such as trihalomethanes (THM). Chloramines do not have this side effect.

Most importantly, it’s a cost-effective disinfection solution.

turbidity

What does it do?

- Affects clarity, taste or smell
- Carries microorganisms and minimizes disinfection effectiveness
- Plugs solenoid valves, orifices, drains, etc.
- Excessive turbidity often triggers a boil water advisory as the water is too cloudy to accurately test for the presence of cysts



human hair

75 microns

visible to the human eye

40 microns

cysts

3 - 5 microns

recap

Water is the world's greatest solvent; it picks up characteristics of everything it comes in contact with. While there are many elements found in water, the three that affect foodservice equipment & beverages the most are:

hardness

All water supplies, regardless of source, contain some amount of total dissolved solids (TDS) and that includes minerals that form into scale.

chlorine/chloramines

All municipal water supplies are disinfected with either chlorine or chlorine and ammonia (chloramines).

turbidity

All water supplies, regardless of source, contain suspended dirt that you cannot see with the human eye.

DANAMARK WATERCARE

thank you for your time