FAQs

What are the most common uses for recycled water?
In California, agriculture accounts for approximately 50 percent of recycled water use while landscape irrigation accounts for about 20 percent. Recycled water has safely been used to irrigate public facilities such as school grounds, athletic fields, golf courses, parks, common areas of residential neighborhoods, and lawns at single-family residences for many years. There have not been any reported cases of illness or allergies as a result of its use for landscape irrigation or agricultural uses. Other uses include industrial applications and groundwater recharge.

Is recycled water safe?
Yes, it is safe. Tertiary-treated recycled water meets standards that allow it to be used for most non-drinking purposes. In California, the Regional Water Quality Control Board and California Department of Public Health have strict permitting and monitoring procedures to ensure the reliability of treatment processes and controlled use of recycled water. Disinfected tertiary-treated recycled water is virtually free from all pathogens, including viruses. Several long-term microbiological studies of viruses in tertiary-treated recycled water have confirmed the absence of pathogens in thousands of tertiary-treated recycled water samples.

How do PPCPs end up in recycled water?
The treatment process for wastewater is not designed to remove all the chemicals that become part of the waste stream through human consumption and excretion. Numerous studies have shown that residual amounts of PPCPs remain in treated wastewater at trace concentrations. PPCPs are believed to enter municipal wastewater through bathing, cleaning, laundry, and the disposal of unused pharmaceuticals and human waste.

Is there a treatment process that will remove pharmaceuticals?
The wastewater industry is investing millions of dollars to research the benefits of different treatment processes. Last year, one industry group undertook a study that compared the effectiveness of various treatment/removal processes for a variety of pharmaceuticals. The industry is currently conducting research to determine which processes are most effective in removing various chemical compounds, including pharmaceuticals.

How high are the concentrations of PPCPs in recycled water?
This depends on the level of treatment and the methods used by the wastewater treatment plant that produces your recycled water. Typically, trace levels of PPCPs in recycled water are found in the low microgram (parts per billion) to low nanogram (parts per trillion) per liter range. The risk assessment study used the 90th percentile of measured occurrence data for secondary- and tertiary-treated recycled water presented in *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water; Recommendations of a Science Advisory Panel. Final Draft. California State Water Resources Board, June 25, 2010.*

Do these concentrations pose a risk to children on playgrounds and in parks?
The risk assessment showed that measured concentrations of PPCPs in recycled water do not pose unacceptable risks to children on playgrounds and parks. To help us understand that the health risks from recycled water are minimal, we can compare the exposure of a child on a playground irrigated with recycled water containing trace amounts of a specific PPCP, such as a common antibiotic, against a more familiar exposure, such as an adult dose of that same antibiotic that one might get from the doctor's office. In this example, a child would have to play on a playground for one hour per week, six months a year, with constant contact with recycled water, for 1,900,000 years before being exposed to the equivalent of one dose of that antibiotic.

Is there a risk for landscapers or agricultural workers who come in contact with recycled water?
The relative risks due to exposure for these workers is greater than for a child on a playground, but the risks are still well within an acceptable range. For instance, assuming a landscape worker is exposed to recycled water for an entire 8-hour work day, it would take 69,000 years for that worker to receive the equivalent of one dose of a common antibiotic.

"Defining 'Safe'" continued…

of acetaminophen in recycled water are nearly 100,000 times lower than the safe levels for that child on a playground.

The team used the 90th percentile of measured PPCP concentrations in secondary- and tertiary-treated recycled water from a study that surveyed wastewater treatment plants in California.

"What is Recycled Water" continued…

specific purpose is typically disposed of under strict guidelines set by federal and state agencies.

Most North American communities waste vast amounts of increasingly scarce drinking water to irrigate lawns, gardens, parks, school grounds, highway medians, commercial landscaping and golf courses. Large quantities of drinking water are also used to grow food crops and support other important agricultural activities.

Using precious drinking water for irrigation greatly increases demand and puts a tremendous strain on our limited water supplies, particularly during dry seasons.

Sometimes it is not just a community's water supply that is stressed by these demands. Flows in rivers and waterways can be impacted to the point that fish are unable to complete their reproductive cycles, thus endangering a species' ability to survive. Reduced flows in creeks and rivers can also increase the concentration of harmful pollutants, which adversely affects many aquatic species.

These are just a few of the reasons recycled water has become a highly valuable resource in many areas of the country.

Communities that take advantage of recycled water must adhere to strict health and safety guidelines that require routine testing. In the United States, recycled water has been safely used since 1929, with no known cases of illness as a result.

Visit www.AThirstyPlanet.com for more information about recycled water, its treatment and applications.

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www.athirstyplanet.com

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Recycled Water: How Safe is It?

A Publication from WateReuse Research Foundation

Putting the Risk of Recycled Water into Perspective

As water becomes a scarcer and more precious resource, many communities are making use of recycled water to address growing water demands and limited supplies. One of the hurdles to gaining public acceptance of recycled water projects is perceived human health risks.

Among the perceived risks is concern about the presence of trace concentrations of Pharmaceuticals and Personal Care Products (PPCPs) found in recycled water. But findings from a recent study indicate that, depending on the chemical and the exposure situation, it could take anywhere from a few years to many millions of years of exposure to non-potable recycled water to reach the same exposure to PPCPs that we get in a single day through routine activities.

An agricultural worker in a field irrigated with recycled water.

For example, the study concludes that an agricultural worker would have to toil for 16,000 years in a field irrigated with recycled water to receive the equivalent of a single dose of 17-beta estradiol (prescription hormone replacement). A child could play on a recycled-water-irrigated lawn for 110 million years before being exposed to the equivalent of one application of insect repellant (DEET). (For more results, see "What's the Risk?"on page 3).

To assist in communicating the relative health risks associated with two approved non-potable uses of recycled water, agricultural and landscape irrigation, the WateReuse Research Foundation and participating water agencies commissioned a risk assessment study of PPCPs commonly found in recycled water.

Out of the hundreds of PPCPs that can be detected in recycled water and the environment, a team of scientists identified 10 to include in the study. The selected chemicals include a variety of PPCPs, such as prescription drugs, over-the-counter drugs, household products, food additives and more. Some were chosen because of their associated health risks; others, because they are easily recognized. All are representative of the PPCPs found in recycled water.

To accomplish their task, the researchers studied four situations in which people might typically be exposed to recycled water used for landscape or agricultural irrigation:

- Child playing in a park or schoolyard
- Agricultural worker in the fields
- Landscaper worker maintaining lawns or shrubbery
- Golfer on the greens

These are called "exposure scenarios." These theoretical scenarios all occur in environments irrigated with recycled water. They provide estimates of how much water a person might be exposed to over a period of time. In each situation, the researchers used a high estimate, wherein the subject encounters far more water on a regular basis than would be typical in real world circumstances. This is purposely done to build extra margins of safety into the risk assessment findings.

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What is Recycled Water and Why Do We Use It?

Through nature's cycles, all water on Earth is recycled water. But, typically, when we hear the term "recycled water" it means wastewater that is sent from our home or business through a pipeline system to a treatment facility where it is treated to a level consistent with its intended use or disposal method. It is then routed directly to a recycled water system for uses such as irrigation or industrial cooling.

Many communities use recycled water to irrigate parks and playgrounds.

There are various levels of treatment the water might undergo, including primary, secondary and tertiary. Recycled water that is used for landscape irrigation is treated to a tertiary level, which includes disinfection.

Using precious drinking water for irrigation greatly increases demand and puts a tremendous strain on our limited water supplies, particularly during dry seasons.

In addition to irrigation applications, this highly-treated water has been approved by the federal government and many states for other uses including fire suppression, industrial processes and toilet flushing. Water that is not reused for a

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PPCPs: A Fact of Everyday Life

Pharmaceuticals and Personal Care Products

While most organic and microbial material is removed from wastewater during the tertiary treatment process, studies have shown that trace concentrations of certain compounds, or chemicals, can be found in highly-treated recycled water. Many of the same compounds can also be found, in varying amounts, in drinking water and throughout the environment.

Some of these chemicals are grouped into a category known as Pharmaceuticals and Personal Care Products (PPCPs). As their name implies, these compounds are ingredients that can be found in every day products, such as soaps, cosmetics, household cleaners and over-the-counter or prescription medications. They enter the recycled water system with the products that get washed down our sinks, washing machines, dishwashers, and toilets.

The ability to detect these chemicals at very low levels has outpaced the ability to completely remove them from the environment. For example, a prescription antibiotic, sulfamethoxazole, has been found in recycled water at a concentration of 1.4 microgram per liter (ug/L).

A microgram per liter is one part per billion, or the equivalent of a single sugar cube in an Olympic size swimming pool.

The risk assessment study highlighted in this publication sought to determine how much of these residual chemicals we are exposed to under specific recycled water usage scenarios and to communicate the potential health risks in a meaningful way.

For instance, though no more than 1.4 ug/L of sulfamethoxazole is measured in most recycled water, the acceptable, or safe, concentration for a golfer on a course irrigated with reused water is 190,000 ug/L. In simpler terms, it would take that golfer 1,100,000 years of playing twice a week to be exposed to the equivalent of a single dose of the antibiotic.

The study used measured levels of PPCPs from a report prepared by a science advisory panel for the California State Water Resources Control Board; the concentrations used in the study represent the 90th percentile of detected concentrations in both secondary- and tertiary-treated effluent, or among the highest measured levels from wastewater treatment plants in that state.

"Putting the Risk…" continued…

Using known concentrations of the 10 PPCPs studied, the research team was able to calculate potential health risks. They also compared exposure to PPCPs in recycled water to PPCP exposures from other sources, such as one dose of ibuprofen or one application of insect repellant.

The risk assessment findings are being used to foster open communications and promote informed public discussions about the relative health risks associated with the use of recycled water.

What is Risk Assessment?

Risk assessment is a process that examines the toxicity of a chemical and the potential exposure to that chemical in order to estimate the risk to human health. Risk is a combination of toxicity and exposure (Risk = Toxicity x Exposure). The risk assessment study discussed in this publication used the U.S. EPA risk assessment methodology, which includes assessing exposure, dose and characterization of risk.

Defining "Safe"

The idea of being "safe" is a relative concept. As individuals we make decisions about our own safety and the relative risks we are willing to take. As a society, we make collective decisions about safety and risk. These decisions weigh the risks against the benefits. Understanding those risks and benefits is fundamental to making sensible choices.

While scientists acknowledge that excess exposure to chemicals may pose health risks, our society as a whole sees benefit in using chemicals in controlled quantities to improve our lives. Therefore, "safe" or "acceptable" exposure levels are established for compounds that we come into contact with every day.

For the risk assessment study highlighted in this publication, acceptable concentrations of PPCPs were derived from Acceptable Daily Intake (ADI), which were in turn derived from chemical-specific information available in other existing studies.

For example, the acceptable daily intake for acetaminophen (Tylenol) is based on the therapeutic dose in combination with an additional factor for further protection of human health. The acceptable concentrations represent what can be present in recycled water and not exceed the ADI, based on the various exposure scenarios.

Next, the risk assessment team compared acceptable concentrations with actual concentrations of PPCPs found in recycled water. Actual concentrations are all considered "safe" and the comparison showed they are typically only a tiny fraction of acceptable concentrations.

For example, for a child on a playground irrigated with recycled water, the acceptable concentration of acetaminophen is 57,000 micrograms per liter, while the actual concentration detected in most recycled water is less than 0.55 micrograms per liter.

Viewed another way, actual concentrations

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WHAT'S THE RISK?

A Comparison of Exposure to PPCPs from Recycled Water vs. Conventional Uses

This chart compares typical exposures to three Pharmaceuticals and Personal Care Products (PPCPs) — antidepressant, ibuprofen, hormone — with exposure to the same chemicals in recycled water under four different scenarios in which a person may come into contact with the water. For each scenario — child at play, agricultural worker, landscaper, and golfer — the chart shows how many years one could participate in that activity before reaching a single daily dose of the chemical from typical exposures.