From:	McGowan, Vincent (ECY)
To:	OEC; bari.schriener@ecy.wa.gov; Schreiner, Bari (ECY)
Cc:	Jones, Jocelyn (ECY)
Subject:	RE: OEC comments on Reclaimed Water Draft rule
Date:	Monday, October 9, 2017 3:47:03 PM

Hello Ms. Schanfald –

Please consider this email as confirmation of receipt of your comments on the Reclaimed Water Draft rule. I will ensure they are considered along with the other comments. And we will look into why eComment may have acted this way. Apologies for the inconvenience.

Thank you for your comments.

Vince McGowan
Department of Ecology | Water Quality | Municipal Unit Supervisor
PO Box 47600 | Olympia, WA 98504-7600 | ph.360-407-6435

From: OEC [mailto:oec@olympus.net]
Sent: Sunday, October 8, 2017 9:51 PM
To: McGowan, Vincent (ECY) <vmcg461@ECY.WA.GOV>; bari.schriener@ecy.wa.gov
Subject: Fwd: OEC comments on Reclaimed Water Draft rule

The eComment dial never stopped, so I assumed the comments did not get submitted electronically. I sent these to Jocelyn, but she is away until the 13th.

Please confirm receipt of the comments.

Thank you,

Darlene Schanfald
Olympic Environmental Council
PO Box 2664
Sequim WA 98382
1-360-681-7565

Begin forwarded message:

From: OEC <oec@olympus.net>
Subject: OEC comments on Reclaimed Water Draft rule
Date: October 8, 2017 at 9:18:37 PM PDT
To: Jocelyn Jones <jocelyn.jones@ecy.wa.gov>
Cc: Oec <oec@olympus.net>

Olympic Environmental Council

October 6, 2017 PO Box 2664 Sequim WA 98382

Jocelyn W. Jones
Water Quality| Rule Writer
WA State Department of Ecology
Olympia WA 98504
| *jocelyn.jones@ecy.wa.gov*

The Olympic Environmental Council (OEC) wishes to comment on the WA State Department of Ecology (Ecology) Draft Rule for reclaiming water (RW) on behalf of its over 100,000 members. The rule making for reclaiming treated sewage water (wastewater/effluent) is for the purpose of recycling it on crops, recreational fields, wetlands (current and building creating wetlands for this purpose), and potentially potable water -- which the WA State Department of Health would oversee.

The OEC acknowledges that removing this toxic water from the marine system is important. However, we do not favor putting it on land or using it for potable water, including pumping into aquifers. Given that the wastewater treatment plants are old, were never intended to clean the many thousands of chemicals and the array of pathogens that daily flow into these facilities, and need replacing, we strongly encourage Ecology to turn its attention to encouraging communities building of waste-to-energy facilities; to study the advanced treatment and reuse methods in which European countries invested. As your Draft rule now stands, it is putting profit in front of public safety

And like so many other examples – recycling Hanford's Cesium 137 in consumer goods and food irradiation plants, aluminum waste in consumer products and water, sewage sludge as fertilizer/compost, this is a government effort to recycle another toxic source. But this time the science is ahead. We have included just a few references at the end of our comments.

COMMENT OVERVIEW

- The rule language is not science based.
- The legislative language is years prior to much of the science on the hazards of reclaiming water and preferred treatment methods.
- Very few wastewater constituents are assessed; most are unknown. And there are current studies of which this rule does not recognize that raise red flags to reuse this water. Pathogens like prions and anti-biotic resistant genes can not be treated and can multiply. Contaminants of emerging concern, ultrafine particulate matter, plastic fibers

are just a few examples that pass through treatment and will remain in reclaimed waters.
• Methods for "further treatment" – chlorination, UV light, ultraviolet light – are problematic. For instance, chlorination leaves an unwanted byproduct in the water.
• Lacking are long term health studies from use this as potable water
• Injecting reclaimed water into aquifers has a high probability of contaminating public drinking water systems.
• Class A water may be cleaner than Class B, but it is far from clean or safe. It better dissolves water soluble medications but not fat soluble medication, and not too much more. And once a tertiary treatment facility is permitted, it requires no oversight.
• There is no reliable, foolproof method that creates safe potable water. Safer does not mean safe.
• RCWs used for this purpose seemed to fit the purpose. Do they conflict with other pertinent RCWs/? Do they conflict with any parts of the CWA? Those rules should be included.
• Facilities regulate themselves. Government staffs are being cut; enforcement now lacks.
• It is admitted that allowable limits of a pollutant deemed safe are more generous that what scientists would deem safe. Science should drive the rules.
• Under the SEPA Checklist, while all the questions under Earth od not directly apply here, the fact is that putting this unclean water on land will affect soils, air, water, humans and wildlife.

SPECIFIC COMMENTS AND QUESTIONS

Preliminary Regulatory
Analyses https://fortress.wa.gov/ecy/publications/documents/1710022.pdf

The goals and objectives of the authorizing statute are:
• Encourage the development of water reclamation facilities
• Encourage the use of reclaimed water to help meet the growing need for clean water across the state by establishing standards for a product that may be used to replace potable water in nonpotable applications.
• Provide a drought resistant source of water supply for nonpotable needs.
• Contribute to the restoration of Puget Sound by reducing wastewater discharges
P. 37 6.2 Goals and objectives of the authorizing statute: Chapter 90.46 RCW

GENERAL COMMENTS
• Are only monetary costs considered?
• The authorizing statutes are old. Current science is not considered. This leaves the "reasonable understanding" questionable.
Ecology concludes, based on its reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the proposed rule, that the benefits of

the proposed rule are greater than the costs. Ecology assessed alternatives to proposed rule content, and determined whether they met the goals and objectives of the authorizing statutes. Of those that would meet these goals and objectives, Ecology determined whether those chosen for the proposed rule were the least burdensome to those required to comply with them. After considering alternatives to the proposed rule's contents, as well as the goals and objectives of the authorizing statute, Ecology determined that the proposed rule represents the least burdensome alternative of possible rule contents meeting these goals and objectives

• Given the known and unknown contents of this water, the standard of meeting "only water meeting stringent water quality and public health requirements is not possible.
• The rules are not the most stringent. Therefore it is not possible to meet at least these goals: Scientifically and legally sound standards and practices that protect human health and the environment and Meets both Health and Ecology legal obligations to protect human health and the environment. (P. 1)
• Again, the water cannot be "adequately and reliably treated" when some that are known cannot be treated, such as micro plastics that attract PCBs and ultrafine particulates, and most contents are unknown and will not be accounted for.
P. 1 1.1 Legislative direction and history of rule development Reclaimed water is generated from wastewater with a domestic wastewater component that has been adequately and reliably treated so that it can be used for beneficial purposes. Once reclaimed, this water is not considered a wastewater. The process of reclaiming water, sometimes called water recycling, involves a highly engineered, multi-step treatment process that mimics nature's restoration of water quality. The process provides a high-level of disinfection and treatment unit reliability and redundancy to assure that only water meeting stringent water quality and public health requirements leaves the treatment facility for an approved use.

• Twenty years have passed and many peer reviewed scientific studies released that would make the Standards obsolete, or at least show cause for reconsideration.
P. 18 The **1997** Water Reclamation and Reuse Standards emphasize public health protection and provide design, treatment, and use area criteria for the following reclaimed water categories:
• General requirements (e.g., land application, impoundments, commercial and industrial uses)
• Use in wetlands
• Groundwater recharge (direct and surface percolation)
While these water reclamation and reuse standards are not currently codified they are the **standard reference** used by Ecology and Health for reclaimed water permitting. The standards were based on the laws and rules included in the list above.
• What costs are being "mitigated?"
• Exactly which impacts are not expected?
P.15 Discharge and construction standards for water and wastewater Moreover, it is consistent with other Ecology permitting program requirements designed to mitigate

information costs. Reclaimed water facilities already need to comply with these rules under the baseline. No impact is expected.

• Exactly which impacts are not expected?

P. 15 Class B requirements The proposed rule follows requirements and processes for water releases classified as Class B, as based on the authorizing law (chapter 90.46 RCW), and on existing applicable standards. Moreover, it is consistent with other Ecology permitting program requirements designed to mitigate information costs. Reclaimed water facilities seeking to release Class B water also need to comply with these rules under the baseline. No impact is expected.

• Would the regulations follow Class A – a 5 year permit, self monitoring, no agency oversight?

P. 15 Class A+ requirements The proposed rule adds a category of reclaimed water that could be beneficially used for direct potable reuse. Specific requirement are not specified in the rule and would be established on a case-by-case basis by Health. Any Class A+ use must also be approved by the state board of health.

• What impacts are not expected?

P. 16 2.3.38 WAC 173-219-380 General use-based requirements The rule provides general use-based requirements that are applicable to all uses of reclaimed water, such as site evaluation, signage or advisory notification, label and design requirements, confining the use to site, and restricting operations to authorized personnel. Reclaimed water facilities also need to comply with these rules under the baseline. No impact is expected.

• AKART isn't met. This should include current science, but this Draft rule doesn't address.

• Why is there an option to demonstrate why groundwater should be degraded?

• 1996 and 2005. The last revision was 12 years ago. Are revisions necessary again?

P. 17: AKART has specific and separate cost tests for determining reasonable costs for conventional and toxic pollutants. If background water quality cannot be maintained, the groundwater regulation and guidance provides that a demonstration should be made of why groundwater should be allowed to be degraded. This demonstration is part of the overriding consideration of public interest process (chapter 173-200 WAC and Implementation Guidance for the Groundwater Quality Standards, Publication no. 90-02, dated 1996, revised 2005).

• Since some WWTPs self monitor and report and there is little or no inspection, decreasing monitoring parameters and frequency just to lower financial costs is not putting public safety first.

PP 29-20: 2.4.5 Monitoring, recording & reporting Basing monitoring requirements on compliance history allows the lead agency to decrease monitoring parameters or the frequency they are monitored when warranted, decreasing these costs. Allowing

monitoring data for wastewater discharge permit will save costs and eliminate redundancy, benefitting regulated entities.
• We oppose this new category. Plastic, fibers, and other are already contaminating drinking water and beer. We include some peer-reviewed science.
P 21 2.4.7 Class A+ requirements Baseline Under the current rules, the A+ class does not exist. Proposed The proposed rule adds a category of reclaimed water that could be beneficially used for direct potable reuse. Specific requirement are not specified in the rule and would be established on a case-by-case basis by Health. Any Class A+ use must also be approved by the state board of health. Expected impact potentially increases costs on regulated entities depending on specific requirements established.

• Why is there an option to demonstrate why groundwater should be degraded?
P. 21: 2.4.8 All permitted discharges must also be treated with AKART and not pollute the waters of the state. The minimum criteria to demonstrate compliance with these criteria are derived from chapter 173-221 WAC and the 1997 guidance Water Reclamation and Reuse Standards.AKART has specific and separate cost tests for determining reasonable costs for conventional and toxic pollutants. If background water quality cannot be maintained, the groundwater regulation and guidance provides that a demonstration should be made of why groundwater should be allowed to be degraded.

• Standards need updating
P. 22 These sections of the proposed rule collect and reference or restate the requirements and allowed uses and standards for using reclaimed water in various land, groundwater, and surface water applications. These are standards that are currently applied from various sections of laws and rules, including the authorizing statute, groundwater and surface water quality standards, public health standards, and standards for public water supplies
and water systems.

* Please expand on “instream flow rights” and Ecology’s position on protecting them.
P. 26 3.2.2 Impairment Analysis The most complex analysis might take place in adjudicated basins with multiple water right holders who exercise state-rights, federal rights, and instream flow rights. Such a situation could incur significant administrative, legal, and mitigation costs.

• Based on the lack of knowledge or the wastewater, “enhancing groundwater” with wastewater could result in polluted groundwater. “Enhanding, etc. wetlands could also result in increasing their pollution and that of dependent wildlife. Adding this pollutant source to fish streams, too, risks the quality of the habitat and the salmon.

P. 28 4.2.1 Bringing together many existing laws and rules used to regulate reclaimed water generation, distribution, and use. The proposed rule brings together many existing laws and rules used to regulate reclaimed water generation, distribution, and use. The primary benefits of the proposed rule come from the creation of a single rule specific to reclaimed water permitting, thereby:
O Enhancing water quality for Washington’s groundwater and surface waters, including Puget Sound and the Columbia River.

O Enhancing, restoring or creating wetlands habitat.
O Contributing to the restoration and protection of instream flows that are crucial to preservation of the state's salmonid fishery.
• Proposed measures will not protect public health. It will only codify standards for your purpose.
P. 29 4.2.1.1 Consolidate requirements to support: Protecting public health and safety through consistent application of requirements for pathogen removal or inactivation wherever the public is exposed to reclaimed water. The proposed rule will codify existing standards found in guidance that provide for enhanced disinfection and in some cases filtration of reclaimed waters in order to remove pathogenic bacteria, viruses, and protozoa from the water produced. A facility cannot legally reclaim water without meeting these standards under the baseline, and therefore no change in compliance behavior is expected; only a change in the ease of accessing consistent, consolidated information on requirements.

• The AKART referred to is not all known or best available science.
P. 29 4.2.1.2 Consolidate requirements to support: Enhancing water quality for Washington's groundwater and surface waters, including Puget Sound and the Columbia River. The consistent application of both drinking water standards and water quality standards, along with technology standards for all known and available reasonable methods of prevention, control and treatment will provide protection of our groundwater quality. Surface waters are protected by applying the water quality standards to develop limits according to the current National Pollutant Discharge Elimination System and surface water quality standards rules. A facility cannot legally reclaim water without meeting these standards under the baseline, and therefore no change in compliance behavior is expected; only a change in the ease of accessing consistent, consolidated information on requirements.

• Human exposure to RW in these areas --agricultural and landscape irrigation, golf course watering – are unsafe.
P. 29 4.2.1.3 Consolidate requirements to support: Promoting wise management of water supplies for beneficial uses by providing alternative sources of water to replace the use of potable water where feasible. The proposed rule promotes this goal of the Reclaimed Water Act to save or reduce demands for potable water by using reclaimed water where feasible to replace potable water. Examples include agricultural and landscape irrigation, golf course watering, industrial, and commercial cooling and process water, and toilet flushing. A facility cannot legally reclaim water without meeting these standards under the baseline, and therefore no change in compliance behavior is expected; only a change in the ease of accessing consistent, consolidated information on requirements.

• According to a 2009 Catalonia Spain study, when RW is used in the context of environmental restoration projects, the economical value is less clear, and indirect techniques of economical ''valorization'' should be applied. https://www.researchgate.net/publication/228416693_Techno-economicalevalutaion of water reuse for wetland restoration:

a case_study_in_a_natural_park_in_Catalonia_Northeastern_Spain

- Would this add additional nutrients into these water systems? It would introduce more toxins.
- When and how will the wetlands be surveyed for water quality conditions, effects on species**?**

P. 29 4.2.1.4 Consolidate requirements to support: Enhancing, restoring or creating wetlands habitat. The proposed rule promotes the use of reclaimed water to enhance or restore damaged wetlands and create new wetland habitat. Reclaimed water is treated to a higher level than wastewater treatment processes and also must reduce nutrient loading to a point where natural biological wetland parameters are sustained. A facility cannot legally use reclaimed water for wetland restoration or enhancement without meeting these standards under the baseline, and therefore no change in compliance behavior is expected; only a change in the ease of accessing consistent, consolidated information on requirements.

- A purpose for RW is to keep it out of the marine system. Yet your intent is to allow it to be put back in the marine system after some, yet minimally studied treatment results. This doesn't make sense. This section is about streamlining requirements and "harmonizing" RCWs, but the point we are making is that the goals conflict.

P. 30 4.2.1.5 Consolidate requirements to support: Contributing to the restoration and protection of instream flows that are crucial to preservation of the state's salmonid fishery. Reclaimed water used for surface water augmentation of rivers, lakes and streams means the intentional use of reclaimed water for the purpose of increasing volumes. The use of reclaimed water for this beneficial purpose will help to restore instream flows and promote healthy habitat for fisheries. A facility cannot legally use reclaimed water to augment surface waters of the state without meeting the requirements of chapter 90.48 RCW and chapter 173-220 WAC under the baseline. Therefore no change in compliance behavior is expected; only a change in the ease of accessing consistent, consolidated information on requirements.

- This would be good PR for promoting reuse of RW. But it would not, in our estimation, be providing the public with the full facts of RW contents and what treatments can and cannot accomplish, as well as human contact with RW.

P. 30 4.2.1.7 Simplifying and clarifying public understanding of reclaimed water process. The existing reclaimed water permitting and regulation process is based on many state and federal laws and rules, as well as existing permitting standards. The agencies who administer these rules also vary. The public's understanding of the sources and qualities of reclaimed water are complicated by this, limiting positive public opinion of reclaimed water uses – especially in agricultural or ground and surface water applications where the public could interact with the water. The proposed rule requires designation of a lead agency to provide clarity on regulatory oversight and a fact sheet to clearly document the legal or factual basis for permit conditions. The proposed rule authorizes the use of combined permits for wastewater and reclaimed water and also allows separate permits to better accommodate the needs of the permittee and provide clarity to the public. Language for standard and specific conditions is included in the proposed rule to facilitate a "no surprises" permit.

• Agencies might "opt out" due to lack of staff capacity. This would not benefit public safety. Opting out should not be an option.

P. 31 4.2.1.10 Streamlining and clarifying agency roles and relationships At a minimum, government agencies involved in reclaimed water include Ecology and Health. Other entities may also be involved, especially in cases of water right impairment. The proposed rule establishes agency responsibilities and clarifies agency relationships within the reclaimed water regulation context. This limits inter-agency duplication of tasks, facilitates compliance and timeliness on both sides of the permit process, and eliminates the ambiguity of agency roles and relationships. The proposed rule also allows the non-lead agency to opt out or limit the scope of their review, thus saving the reclaimed water proponent the time and costs of dual agency reviews

• We would like to see a detailed accounting of all the costs – financial, impacts to health, wildlife, soil, water, and air.

P. 35 5.2 Conclusion Ecology concludes, based on reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the proposed rule, that the benefits of the proposed rule are greater than the costs

• Here again, we weigh in on these need to be the most protective of public health and the environment.

P. 36 Chapter 6: Least-Burdensome Alternative Analysis

6.1 Introduction

… to be able to adopt the rule, Ecology is required to determine that the contents of the rule are the least burdensome set of requirements that achieve the goals and objectives of the authorizing statute(s).

Ecology assessed alternatives proposed rule content, and determined whether they met the goals and objectives of the authorizing statutes. Of those that would meet these goals and objectives, Ecology determined whether those chosen for the proposed rule were the least burdensome to those required to comply with them.

P. 37 6.3.1 Prescriptive requirements on water rights impairment analysis Minimizing prescriptive requirements about the water rights impairment analysis will prevent the need to amend this rule if (or when) there is a legislative change to address the Foster decision. Including more prescriptive requirements would be more burdensome for regulated entities. **SHOULD WE COMMENT HERE. THERE IS AN EARLIER COMMENT.**

• If public safety is a consideration, then Ecology should take into account the request for Wellhead Protection Area and Critical Aquifer Recharge Areas

P. 38 6.3.2 Prohibit use of reclaimed water in Wellhead Protection Areas and Critical Aquifer Recharge Areas Considered in response to stakeholder concerns. This alternative does not meet the goals and objectives of the statute of encouraging the production and use of reclaimed water.

• Again, reconveyance of RW to surface waters seems counterintuitive in that you want to minimize sewage effluent to these waters and treated RW will still be contaminated.

Pp. 38-39 6.3.6 Prohibit the conveyance of reclaimed water through surface waters of the state Some stakeholders would choose to prohibit the conveyance of reclaimed water via waters of the state. Ecology evaluated this concept and based on existing water

• Adequate protection of public and environmental health" is insufficient protection.

P. 39 6.3.7 Application of groundwater quality standards " Setting more stringent and comprehensive groundwater quality standards for reclaimed water was suggested during the preliminary comment process during this rulemaking. Ecology determined that additional cleanup technology requirements added compliance cost burden for permittees in excess of what is needed for adequate protection of public and environmental health.

(1) Chapter 173-219 WAC RECLAIMED WATER

• RCW 90.46 was written in 1995. And though there have been updates, mostly to 2009, current peer reviewed science raises serious cautions. We find this Chapter unsupportable without working through all the related issues raised in science and which we raised above.

Purpose. The purpose of this chapter is to encourage the use of reclaimed water to help meet the growing need for clean water across the state by establishing a regulatory framework for the generation, distribution, and use of reclaimed water for the beneficial uses established in chapter 90.46 RCW and this chapter.

• "Adequate" is not sufficient.

NEW SECTION

WAC 173-219-060

Agency requirements and responsibilities.

(4) Health responsibilities. As the lead agency or the non lead agency, health will:

(a) Develop reclaimed water permit requirements as necessary to ensure **adequate** public health protection in the generation, storage, delivery, and use of reclaimed water and to regulate facility upgrades, modifications, and operation of all sewer systems and associated on-site sewage system facilities that collect or treat wastewater, generate, and, if applicable, deliver reclaimed water.

• This is a chronic permit issue. Staff capacity lacks and permit renewal requests linger for years. This is a long time problem for renewal of NPDES permits. How would this time differ?

P. 9 (4)

Reclaimed water permit renewal.

(a)At least one hundred eighty days before expiration of the reclaimed water permit, a permittee must submit a renewal application provided by the lead agency.

(b)As long as the permittee meets the renewal application requirements and deadlines for renewal, an expiring reclaimed water permit remains in effect and enforceable until the lead agency either denies the application or issues a renewed permit.
(c)If a permittee fails to meet the deadline or application requirements for renewal, the permit expires on the expiration date provided for in the permit.

- Self-monitoring and testing is of major concern to us. Where does Ecology and Health oversight come in? Only in self-written reports? Here again, this begs the question of staff capacity to oversee this program and activities. Where will fingers point when something goes wrong? Detroit self-monitored. Freedom Industries self-monitored. Pulp and paper companies self-monitored until they became superfund sites. Etc.

P. 26 NEW SECTION WAC 173-219-260 Monitoring, recording, and reporting.
(1) A detailed **self-monitoring and testing** schedule for water quality limits, other substances, or parameters, required to demonstrate that the reclaimed water is protective of human health and the environment.

RFERENCES

https://www.ncbi.nlm.nih.gov/pubmed/27021726
Environ Sci Technol. 2016 Apr 19;50(8):4476-82. doi: 10.1021/acs.est.5b06256. Epub 2016 Apr 7.
Human Exposure to Wastewater-Derived Pharmaceuticals in Fresh Produce: A Randomized Controlled Trial Focusing on Carbamazepine.
Paltiel O[1,2,3], Fedorova G[3,4], Tadmor G[1,3,4], Kleinstern G[1,3], Maor Y[3], Chefetz B[3,4].

Author information

Abstract

Fresh water scarcity has led to increased use of reclaimed wastewater as an alternative and reliable source for crop irrigation. Beyond microbiological safety, concerns have been raised regarding contamination of reclaimed wastewater by xenobiotics including pharmaceuticals. This study focuses on carbamazepine, an anticonvulsant drug which is ubiquitously detected in reclaimed wastewater, highly persistent in soil, and taken up by crops. In a randomized controlled trial we demonstrate that healthy individuals consuming reclaimed wastewater-irrigated produce excreted carbamazepine and its metabolites in their urine, while subjects consuming fresh water-irrigated produce excreted undetectable or significantly lower levels of carbamazepine. We also report that the carbamazepine metabolite pattern at this low exposure level differed from that observed at therapeutic doses. This "proof of concept" study demonstrates that human exposure to xenobiotics occurs through ingestion of reclaimed wastewater-irrigated produce, providing real world data which could guide risk assessments and policy designed to ensure the safe use of wastewater for crop irrigation.
PMID: 27021726 DOI: 10.1021/acs.est.5b06256

EST-Wu-2014.pdf
Environmental Science and Technology
Treated Wastewater Irrigation: Uptake of Pharmaceutical and Personal Care Products by Common Vegetables under Field Conditions

ABSTRACT: Global water shortage is placing an unprecedented pressure on water supplies. Treated wastewater is a valuable water resource, but its reuse for agricultural irrigation faces a roadblock: the public concern over the potential accumulation of contaminants of emerging concern (CECs) into human diet. In the present study, we measured the levels of 19 commonly occurring pharmaceutical and personal care products (PPCPs) in 8 vegetables irrigated with treated wastewater under field conditions. Tertiary treated wastewater without or with a fortification of each PPCP at 250 ng/L, was used to irrigate crops until harvest. Plant samples at premature and mature stages were collected. Analysis of edible tissues showed a detection frequency of 64% and 91% in all vegetables from the treated wastewater and fortified water treatments, respectively. The edible samples from the two treatments contained the same PPCPs, including caffeine, meprobamate, primidone, DEET, carbamazepine, dilantin, naproxen, and triclosan. The total concentrations of PPCPs detected in edible tissues from the treated wastewater and fortified irrigation treatments were in the range of 0.01−3.87 and 0.15−7.3 ng/g (dry weight), respectively. Annual exposure of PPCPs from the consumption of mature vegetables irrigated with the fortified water was estimated to be only 3.69 μg per capita. Results from the present study showed that the accumulation of PPCPs in vegetables irrigated with treated wastewater was likely limited under field conditions.

http://pubs.acs.org/doi/abs/10.1021/es202775r
Tertiary-Treated Municipal Wastewater is a Significant Point Source of Antibiotic Resistance Genes into Duluth-Superior Harbor
Environ. Sci. Technol., **2011**, *45* (22), pp 9543–9549
Abstract

In this study, the impact of tertiary-treated municipal wastewater on the quantity of several antibiotic resistance determinants in Duluth-Superior Harbor was investigated by collecting surface water and sediment samples from 13 locations in Duluth-Superior Harbor, the St. Louis River, and Lake Superior. Quantitative PCR (qPCR) was used to target three different genes encoding resistance to tetracycline (*tet*(A), *tet*(X), and *tet*(W)), the gene encoding the integrase of class 1 integrons (*intI1*), and total bacterial abundance (16S rRNA genes) as well as total and human fecal contamination levels (16S rRNA genes specific to the genus *Bacteroides*). The quantities of *tet*(A), *tet*(X), *tet*(W), *intI1*, total *Bacteroides*, and human-specific *Bacteroides* were typically 20-fold higher in the tertiary-treated wastewater than in nearby surface water samples. In contrast, the quantities of these genes in the St. Louis River and Lake Superior were typically below detection. Analysis of sequences of *tet*(W) gene fragments from four different samples collected throughout the study site supported the **conclusion** that tertiary-treated

municipal wastewater is a point source of resistance genes into Duluth-Superior Harbor. This study demonstrates that the discharge of exceptionally treated municipal wastewater can have a statistically significant effect on the quantities of antibiotic resistance genes in otherwise pristine surface waters.

Front Microbiol. 2012; 3: 106.
Published online 2012 Mar 22.
http://journal.frontiersin.org/article/10.3389/fmicb.2012.00106/full

Increased Levels of Multiresistant Bacteria and Resistance Genes after Wastewater Treatment and Their Dissemination into Lake Geneva, Switzerland

Abstract

At present, very little is known about the fate and persistence of multiresistant bacteria (MRB) and their resistance genes in natural aquatic environments. Treated, but partly also untreated sewage of the city of Lausanne, Switzerland is discharged into Vidy Bay (Lake Geneva) resulting in high levels of contamination in this part of the lake. In the present work we have studied the prevalence of MRB and resistance genes in the wastewater stream of Lausanne. Samples from hospital and municipal raw sewage, treated effluent from Lausanne's wastewater treatment plant (WTP) as well as lake water and sediment samples obtained close to the WTP outlet pipe and a remote site close to a drinking water pump were evaluated for the prevalence of MRB. Selected isolates were identified (16S rRNA gene fragment sequencing) and characterized with regards to further resistances, resistance genes, and plasmids. Mostly, studies investigating this issue have relied on cultivation-based approaches. However, the limitations of these tools are well known, in particular for environmental microbial communities, and cultivation-independent molecular tools should be applied in parallel in order to take non-culturable organisms into account. Here we directly quantified the sulfonamide resistance genes *sul1* and *sul2* from environmental DNA extracts using TaqMan real-time quantitative PCR. Hospital sewage contained the highest load of MRB and antibiotic resistance genes (ARGs). Wastewater treatment reduced the total bacterial load up to 78% but evidence for selection of extremely multiresistant strains and accumulation of resistance genes was observed. Our data clearly indicated pollution of sediments with ARGs in the vicinity of the WTP outlet. The potential of lakes as reservoirs of MRB and potential risks are discussed.

Unilever US discloses fragrance ingredients in nearly 100 products
Other companies will also release their information.
https://chemicalwatch.com/58617/unilever-us-discloses-fragrance-ingredients-in-nearly-100-products?pa=tru 9/13/17

Tannery waste dumped at landfill tied to municipal water pollution http://www.mlive.com/news/index.ssf/2017/09/wolverine_beltline_landfill_pf.html#incart_river_index

Plastic fibres found in tap water around the world, study reveals
https://www.theguardian.com/environment/2017/sep/06/plastic-fibres-found-tap-water-around-world-study-reveals?CMP=share_btn_link

Pathogen Distribution in an Effluent-Dominant Stream
http://www.swhydro.arizona.edu/archive/V3_N6/feature5.pdf
This study examined the fate and transport of several pathogens commonly found in wastewater using samples collected along a 13-mile transect downstream from a treatment plant on the Santa Cruz River in Tucson, Arizona. It was found that concentrations of **E. coli increased with distance** from the wastewater plant discharge point, contrary to what might be expected from bacteria die-off. Although the wastewater was chlorinated prior to discharge, **it is possible that this commonly used disinfection process did not kill but only injured the E. coli population, which then re-established itself downstream.** Several species of pathogens were also detected in shallow monitoring wells near the discharge point, but the environmental fate and transport of these microbes and their potential effects on drinking water are largely unknown. Although human pathogens have traditionally not been thought to flourish in soil environments, this study underscores the pressing need for further research to assess the impacts of reclaimed effluent on surface and groundwater quality.
Groundwater Impacted by Effluent **Total and fecal coliforms have been used for many years as water quality indicators. However, some pathogens, including protozoa, have higher resistance to chlorine disinfection than indicator bacteria and can survive long enough to percolate into groundwater. (**Emphasis is the author's.)

Enabling Adaptive UV and Solar-Based Disinfection Systems to Reduce the Persistence of Viral Pathogens in Wastewater for Sustainable Reuse

https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/10500/report/0
"While chlorination is inexpensive, high levels of organic matter in wastewater will allow the formation of toxic disinfection byproducts. Unfortunately, both UVC and solar disinfection of viruses are hindered by incomplete knowledge of virus disinfection mechanisms in water reuse. This lack of understanding represents a critical knowledge gap that prevents utilities and regulatory agencies from evaluating treatment system designs to ensure the protection of human health.

GAO-11-346: Published: Aug 8, 2011. Publicly Released: Sep 8, 2011
United States Government Accountability Office
GAO Report to Congressional Requesters ENVIRONMENTAL HEALTH
http://www.gao.gov/assets/330/322460.pdf GAO-11-346
• According to USGS scientists, the main source of human pharmaceuticals in the environment is likely treated wastewater from households, industry, and commercial facilities. drinking water from streams where these have been dumped.
• The pharmaceuticals enter the

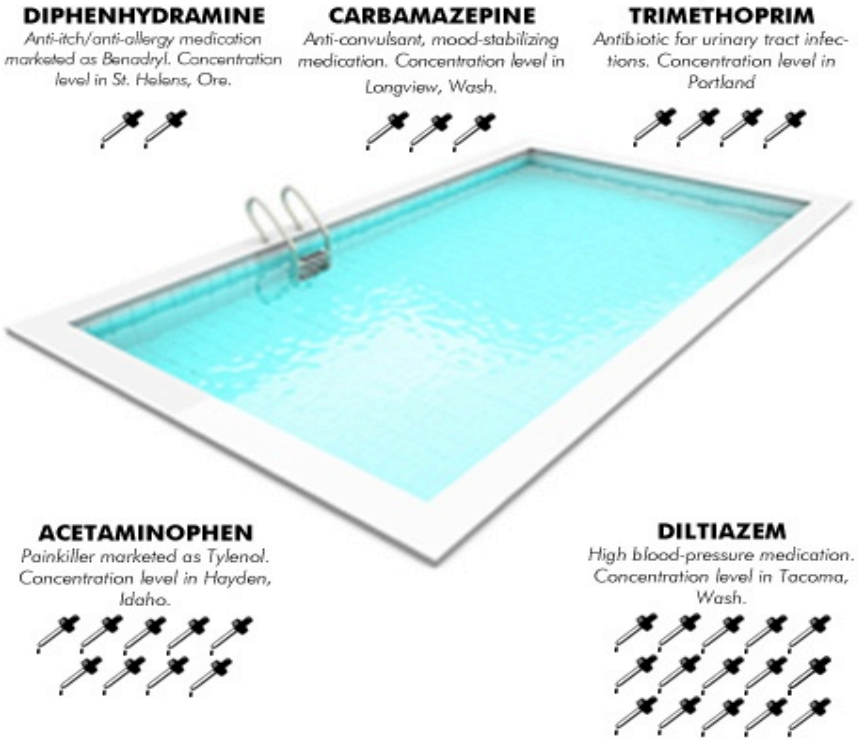
environment either directly from waste storage structures as a result of accidents or weather conditions, or through the application of manure and liquid waste to croplands.

• Biosolids from wastewater treatment plants applied to land as fertilizer may also be a source of human pharmaceuticals in the environment. Septic systems may be a source of human pharmaceuticals in ground water. A potential source of veterinary pharmaceuticals is agricultural facilities where large numbers of food-producing animals (such as chickens, cattle, and swine) are treated with pharmaceuticals. The pharmaceuticals enter the environment either directly from waste storage structures as a result of accidents or weather conditions, or through the application of manure and liquid waste to croplands.

http://www.opb.org/news/article/pharmaceuticals-in-the-water/

Pharmaceuticals In Northwest Waters

Pharmaceuticals are being detected in Northwest water even after it's been processed through wastewater treatment plants. Scientists and health experts are trying to determine the environmental and health impacts.



Note: Above are examples of concentration levels of pharmaceutical drugs recorded in different cities' treated wastewater that flows back into rivers. Each dropper represents the number of drops per Olympic-size swimming pool, which holds 660,000 gallons. (Sources: U.S. Geological Survey; Washington Dept. of Ecology).

Darlene Schanfald
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